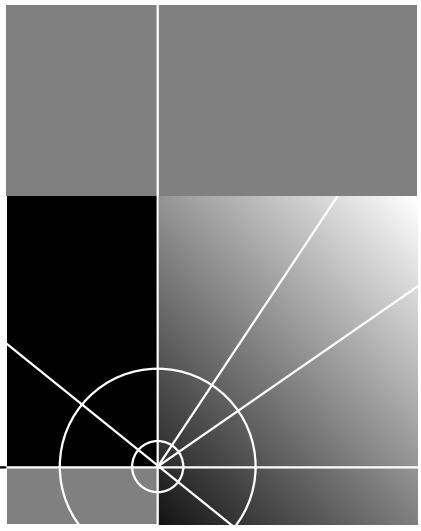
Using the SuperStack® II NETBuilder® SI Bridge/Router



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The ISDN cable is a TNV connection point as defined by EN 41 003. The ports L1, L2, Console, and SERIAL A and B are SELV ports as defined by EN 41 003.

Electromagnetic Compatibility Information

Classes
Various national agencies (in the United States, The Federal Communications Commission (FCC)) govern the levels of electromagnetic emissions from digital devices. Electromagnetic emissions can interfere with radio and television transmission. To reduce the risk of harmful interference these agencies have established requirements for manufacturers of digital devices

The manufacturer of a digital device must test and label a product to inform an end-user of the maximum emission level from the product when used in accordance with its instructions. The emission levels encountered are classified as Class A or Class B. A system that meets the Class A requirement can be marketed for use in an industrial or a commercial area. A system that meets the more stringent Class B requirement can be marketed for use in a residential area in addition to an industrial or a commercial area.

The end user is generally held responsible for ensuring that her system is suitable for its environment as stated in the above paragraph and bears the financial responsibility for correcting any harmful interference.

Modifications
Modifications or changes made to this device, and not approved by 3Com, may void the authority granted by the FCC, or other such agency, to operate this equipment.

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Shielded Cables
Connections between 3Com equipment and other equipment and peripherals must be made using shielded cables in order to maintain compliance with FCC, and other agency, electromagnetic frequency emissions limits. This statement does not apply to the ISDN cable or 10BASE-T cables.

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can create radio frequency energy and, if not installed and used inaccordance with the instruction manual, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In order to meet FCC Class B limits, this equipment must be used only with cables which comply with IEEE 802.3.

The user may find the following booklet prepared by the Federal Communication Commission helpful:

How to Identify and Resolve Radio-TV Interference Problems

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

Canadian Notice

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Avis Canadien
Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le ministre des Communications.

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Canadian Certification Notice

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: *Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.*

FCC Part 68

This eqquipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the product is a label that contains the FCC registration number for this device. If requested, this information must be provided to the telephone company.

This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.

If this device causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. The telephone company may request that you disconnect the equipment until the problem is resolved.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of this equipment If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment or for repair or warranty information, please follow the applicable procedures explained in the "Technical Support" section of this manual.

CSU/DSU Module

This device is intended to connect to Digital Data Services in the USA. Please inform the telephone company of the following information pertaining to this device before installation. Note that this device does not handle encoded analogue content and therefore does not require that a Digital Affidavit be filed with the telephone company.

FCC Registration Number	See label on product
Required connector (USOC)	RJ-48S
Service Order Code (SOC)	6.OF
Facility Interface Codes (FIC)	04DU5-56, 04DU5-64

NT1 Module

This device is intended to connect to ISDN Basic Rate Service in the USA. Please inform the telephone company of the following information pertaining to this device before installation. Note that this device does not handle encoded analogue content and therefore does not require that a Digital Affidavit be filed with the telephone company.

FCC Registration Number	See label on product
Required Connector (USOC)	RJ-49
Service Order Code (SOC)	6.OF
Facility Interface Codes (FIC)	02IS5

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CE Notice

Marking by the symbol CE0344X indicates compliance of this equipment with the EMC, Telecom and Low Voltage Directives of the European Community. Such marking is indicative that this equipment meets or exceeds the following technical standards:

EN55022 — Limits and methods of measurement of radio interference characteristics of information technology equipment.

EN50082-1 — Electromagnetic compatibility - generic immunity standard part 1: residential, commercial, and light industrial.

CTR2 — Connection of WAN ports to X.25 packet switching and X.21 leased line services.

CTR 3 — Connection to Basic Rate ISDN services.

EN 60950 — Safety of Information Technology Equipment including Electrical Business Equipment.

EN 41003 — Particular safety requirements for electrical equipment to be connected to Telecom networks.

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CONTENTS

ABOUT THIS GUIDE

Conventions 15
Year 2000 Compliance 16

1 FEATURES AND SPECIFICATIONS

Features 17
Back and Front Panels 18
DIP Switches 20
Hardware Interrupt Switch 20
Reset Button 21
Serial Device Requirements 21

2 USING THE BRIDGE/ROUTER IN YOUR NETWORK

Overview 23
Using Ethernet LAN Ports 23
Using WAN and Serial Ports 24
- ISDN Port (Model 43x, 53x, 44x and 54x) 24
- 56/64K CSU/DSU Port (Model 45x and 55x) 24
- T1/FT1 CSU/DSU Port (Model 46x and 56x) 24
- Serial Ports 25

Telco Services 25
- Using PPP on Dial-Up and Leased Lines 26
- Using Packet-Switched Network Services 26

IBM Legacy Networks 27

3 INSTALLING THE HARDWARE

Required Equipment 29
Environmental Requirements 30
Mounting the Bridge/Router 31

Downloaded from www.Manualslib.com manuals search engine

Mounting Kit 31
Installing on a Tabletop 31
Stacking with Brackets 32
Installing in a Rack 33
Cabling the Connectors 34
Cabling the LAN Connectors 34
Cabling the WAN Connector 35
Model 43x and 53x ISDN S/T 35
Model 44x and 54x ISDN U 35
Model 45x and 54x 56/64K CSU/DSU 36
Model 46x and 56x T1/FT1 36
Cabling the Serial Connectors 37
Attaching a Redundant Power System 38
Connecting a PC, Terminal, or Modem 39
Shutting Down 39

4 INSTALLING OR REMOVING AN INTERFACE MODULE
Removing the Cover 41
Removing an Existing Module (Model 4xx) 43
Installing a New Module (Model 4xx) 45
Removing an Existing Module (Model 5xx) 47
Installing a New Module (Model 5xx) 49

5 LOGGING ON AND PERFORMING ADMINISTRATIVE TASKS
Turning on the System 53
Verifying Successful Startup 54
Attaching a Console 55
Logging on to the System 55
Choosing the User Interface 56
Deciding which Interface to Use 56
Using Menus 56
Using the Command-line Interface 57
Changing the Root Password 59
Changing the Default Console Port Baud Rate 60
Adding User Accounts 60
Setting the Time and Date 61
Setting System Information 61

Downloaded from www.Manualslib.com manuals search engine

Setting Up Security 62

6 BASIC CONFIGURATION OF PORTS AND PATHS

Paths, Ports, and Virtual Ports 63
- Paths and Ports 63
- Dynamic Paths 64
- Multiple Static Paths per Port 65
- Virtual Ports 65
  - Virtual Ports over Frame Relay and X.25 66
  - Virtual Ports over PPP 67
  - Parent Ports for Frame Relay and X.25 68

Path and Port Numbering 69
Configuring Ethernet Paths and Ports 70
Configuring ISDN on the WAN Port (43x, 44x, 53x, and 54x) 70
- Configuring ISDN in the U.S. and Canada 70
- Configuring ISDN in Europe, Australia, and Asia 71
- Placing a Data Over Voice Call 72
  - Example 73
- Enabling Digi64S2 73

Configuring the 56/64 Kbps CSU/DSU WAN Port (Model 45x and 55x) 74
Configuring the T1/FT1 RJ-48 Telco Port (Model 46x and 56x) 74
Configuring Serial Ports with DCEs 75
Configuring Serial Ports with DTEs 76
Where to Go From Here 77

7 ADVANCED CONFIGURATION OF PORTS AND PATHS

Configuring Dial-Up Lines with PPP 79
- ISDN on the WAN Port (43x, 44x, 53x and 54x) 80
  - Scenario 1: Using Each B Channel Separately 81
  - Scenario 2: Using Both B Channels Together 82
  - Scenario 3: Connecting to Multiple Destinations 82
- Configuring Dial-Up over PPP with Modems or TAs 86
  - Scenario 1: Single Destination per Port 86
  - Scenario 2: Multiple Destinations 87
- Configuring Bandwidth Management for PPP 89
  - Setting Normal Bandwidth 89
  - Enabling Dial-On-Demand 90

Downloaded from www.Manualslib.com manuals search engine

Using Manual Dial 90
Configuring Bandwidth-On-Demand 91
Configuring Disaster Recovery 92
Configuring Frame Relay 93
Scenario 1: Multiple Destinations, Nonmeshed 94
Scenario 2: Partially Meshed Topology 95
Scenario 3: Fully Meshed Topology 97
Configuring X.25 97
Scenario 1: Multiple Destinations, Nonmeshed 98
Scenario 2: Fully Meshed Topology 99
Where To Go From Here 99

8 CONFIGURING BRIDGING AND ROUTING

Configuring the Central Node for Boundary Routing 101
Configuring Transparent Bridging 101
Managing the Bridge/Router 102
Per-Port Transparent Bridging 102
Configuring IP Routing 102
Assigning Addresses and Enabling IP Routing 103
Configuring Static Routes 103
Subnet Masks 105
Override Option 106
Learning Routes with OSPF 106
OSPF over Dial-On-Demand Dial-Up Lines 107
Configuring Route Redundancy 107
Using a Static Route 107
Using OSPF 107
Assigning Addresses Automatically from BOOTP Servers 108
Configuring IPX Routing 109
Assigning Addresses and Enabling IPX Routing 109
Optimizing IPX for Dial-On-Demand Dial-Up Lines 109
Configuring Static Routes 109
Defining a Default Route 110
Override Option 110
Configuring Route Redundancy Using a Static Route 110

Downloaded from www.Manualslib.com manuals search engine

9 CUSTOMIZING YOUR SOFTWARE

Naming Paths and Ports 111
- Path and Port Naming Restrictions 111

Using the 56/64 Kbps CSU/DSU Module Autobaud Feature 112
- Prerequisites 112
- Defaults 112
- Procedure 112

Working with Dial Number Lists 113
- Adding a Phone Number 113
- Redialing When the Connection Fails 113
- Dialing the Same Phone Number Multiple Times 113
- Positioning a Phone Number 114
- Editing an Existing Phone Number 114
- Deleting a Phone Number 114

Using Statistics on the 56/64 Kbps CSU/DSU Port (45x and 55x) 115

Using Statistics on the T1/FT1 RJ-48 Telco Port (46x and 56x) 116
- Network Statistics 116
- User Statistics 117
- T1/FT1 Driver Statistics 118
- T1/FT1 Parameter Configuration 119

Configuring Data Compression 119

A TROUBLESHOOTING

Using the Monitor Utility 121
- Boot 121
- Configure Flash Load 122
- Clear EEPROM 122
- Display Files 122
- Dump 122
- Flash Load 123
- Help 123
- Repeat Last Command 123
- Reset 123
- Self Test 123

Normal LED Meanings 124
- System LEDs 124

Downloaded from www.Manualslib.com manuals search engine

Serial LEDs 124
WAN LEDs 125
LAN LEDs 125
Error LED Meanings 126
Troubleshooting During the Load Phase 126
Troubleshooting During the Test Phase 131
Errors Indicated by the Serial LEDs 131
Errors Indicated by the WAN LEDs 132
Performing Loopback Tests 133
Response to Local Loopback Assertion 133
Performing a Loopback Test on the ISDN Port (43x, 53x, 44x and 54x) 133
Prerequisites 133
Performing a V.54 Loopback Test on the CSU/DSU Port (45x and 55x) 135
Performing a Local Loopback Test on the CSU/DSU Port (45x and 55x) 137
Performing a Remote Loopback Test on a 56/64 Kbps CSU/DSU Module 139
Performing a Local Loopback Test on the T1/FT1 Port (46x and 56x) 141
Performing a Remote Loopback for V.54 on a T1/FT1 Port 142
Performing a Remote ATT Loopback Test on the T1/FT1 Port 142
Performing a Remote ANSI Loopback Test on the T1/FT1 Port 143
QRSS Testing on a T1/FT1 Port 143
Performing a Loopback Test on a Serial Port 144
Performing a Memory Dump 145
Configuring the Dump Destination 146
Obtaining the MAC Address 147
Creating a File for the Memory Dump 147
Verifying the TFTP Process 148
Verifying the Memory Dump Procedure 149

B RELOADING THE SYSTEM SOFTWARE

Reloading the Software 151
Load Errors 152

Downloaded from www.Manualslib.com manuals search engine

C SYNTAX CONVENTIONS

Full Form Syntax 153
Abbreviated Syntax 154
Symbols 154
Full and Abbreviated Syntax Examples 155
Variations in Command Syntax 156
    Entering Service Names in Command Lines 157
Using Aliases 157
Command History Substitution 158
Privilege Level 159
ISDN-Related Syntax Variation (Models 43x and 44x) 159
Getting Help 160

D CONNECTORS AND CABLES

Console Connector and Cables 163
    PC Cable 163
    Terminal Cable 164
    Modem Cable 164
LAN Connector and Cables 165
    10BASE-T Cabling 165
        Cabling Standards 166
    100BASE-TX Cabling 166
        Creating a Valid Network 166
WAN Connector and Cables 170
    ISDN S/T Cable 170
    ISDN U Cable 172
    56/64K CSU/DSU Cable 173
    RJ-48 T1 Cable 174
Serial Connectors and Flex-WAN Cables 174
    RS-232 DTE Cable Pinouts 177
    RS-232 DCE Cable Pinouts 178
    V.35 DTE Cable Pinouts 179
    V.35 DCE Cable Pinouts 180
    X.21 DTE Cable Pinouts 181
    X.21 DCE Cable Pinouts 182
    RS-449 DTE Cable Pinouts 183
    RS-449 DCE Cable Pinouts 184

Downloaded from www.Manualslib.com manuals search engine

RS-530 DTE Cable Pinouts 185

E PROVISIONING YOUR ISDN LINE

Ordering U.S. and Canadian ISDN BRI Services 187
Switch Provisioning Tables 189
AT&T 5ESS Switch 189
AT&T 5ESS Custom Switch 190
DMS 100 and National ISDN 1 191
Siemens EWSD Switch 192
SPIDs 192
NT1s and Power Supplies 193
Ordering German ISDN BRI Services 194
Ordering Dutch ISDN BRI Services 195

F TECHNICAL SUPPORT

Online Technical Services 197
World Wide Web Site 197
3Com FTP Site 197
3Com Bulletin Board Service 198
Access by Analog Modem 198
Access by Digital Modem 198
3ComFacts Automated Fax Service 199
Support from Your Network Supplier 199
Support from 3Com 199
Returning Products for Repair 201

3COM CORPORATION LIMITED WARRANTY

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ABOUT THIS GUIDE

This guide includes basic software configuration information for the the SuperStack® II NETBuilder® SI bridge/router:

For more information about configuring the software, see *Using Enterprise OS Software*.

This guide is intended for experienced system integrators and network administrators.

If release notes are shipped with your product and the information there differs from the information in this guide, follow the instructions in the release notes.

Most user guides and release notes are available in Adobe Acrobat Reader Portable Document Format (PDF) or HTML on the 3Com World Wide Web site:

`http://www.3com.com/`

Conventions

Table 1 and Table 2 list conventions that are used throughout this guide.

Table 1 Notice Icons

Icon	Notice Type	Alerts you to...
	Information note	Important features or instructions
	Caution	Risk of personal safety, system damage, or loss of data
	Warning	Risk of severe personal injury

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Table 2 Text Conventions

Convention	Description
`Screen displays`	This typeface represents information as it appears on the screen.
`Syntax`	Evaluate the syntax provided and supply the appropriate values. Placeholders for values you must supply appear in angle brackets. Example: Enable RIPIP using: `SETDefault !<port> -RIPIP CONTrol = Listen` In this example, you must supply a port number for <port>.
`Commands`	Enter the command exactly as shown in text and press the Return or Enter key. Example: To remove the IP address, enter: **`SETDefault !0 -IP NETaddr = 0.0.0.0`** *This guide always gives the full form of a command in uppercase and lowercase letters. However, you can abbreviate commands by entering only the uppercase letters and the appropriate value. Commands are not case-sensitive.*
The words "enter" and "type"	When you see the word "enter" in this guide, you must type something, and then press Return or Enter. Do not press Return or Enter when an instruction simply says "type."
Keyboard key names	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press Ctrl+Alt+Del
Words in *italics*	Italics are used to: ■ Emphasize a point. ■ Denote a new term at the place where it is defined in the text. ■ Identify menu names, menu commands, and software button names. Examples: From the *Help* menu, select *Contents*. Click *OK*.

Year 2000 Compliance

For information on Year 2000 compliance and 3Com products, visit the 3Com Year 2000 Web page:

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1 FEATURES AND SPECIFICATIONS

This chapter provides an overview of the SuperStack II NETBuilder SI bridge/router and includes the following information:

- Features
- Back and Front Panels
- DIP Switches
- Hardware Interrupt Switch
- Serial Device Requirements

Features

Table 3 lists features of the SuperStack II NETBuilder SI bridge/router.

Table 3 Features of the SuperStack II NETBuilder SI Bridge/Router

Feature		Description
Processor		Motorola 68360 28.1 MHz
Ethernet ports		Two LAN ports that can be used with 10BASE-T or 100BASE-TX Ethernet.
	Boundary routers (model 4xx only)	One active Ethernet port. If you upgrade to full router software, the second port will be functional.
WAN port		The WAN port can be an ISDN S/T, ISDN U, or 56/64 Kbps CSU/DSU port, depending on the interface module installed.
	Boundary routers (model 4xx only)	One active serial or WAN port. The remaining two ports can be used for back-up.
	Models 43x and 53x	WAN port is an **ISDN S/T** port
	Models 44x and 54x	WAN port is an **ISDN U** port
	Models 45x and 55x	WAN port is a **56/64 Kbps CSU/DSU** port
	Models 46x and 56x	WAN port is a **T1/FT1 CSU/DSU** port
Memory		8 MB flash memory and 16 MB DRAM.

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Table 3 Features of the SuperStack II NETBuilder SI Bridge/Router (continued)

Feature		Description
Serial ports		Two (model 4xx) or four (model 5xx) Flex-WAN serial ports that can connect to RS-232, V.35, RS-449, X.21, or RS-530 interfaces. See "Serial Connectors and Flex-WAN Cables" on page 174 for information about Flex-WAN cables.
	Boundary routers (model 4xx only)	One active serial or WAN port. The remaining two ports can be used for back-up.

Back and Front Panels

Figure 1 shows the back panel of the SuperStack II bridge/router.

Figure 1 Back Panel

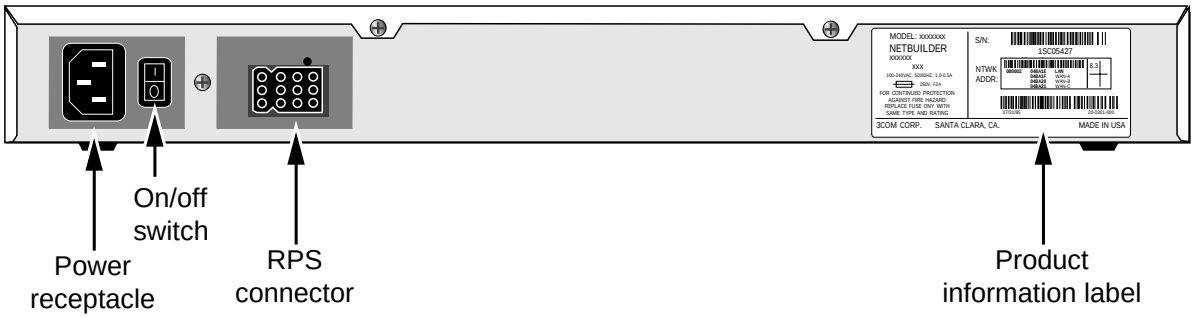

Figure 2 shows the front panel of the model 4xx bridge/router and the model 5xx bridge/router.

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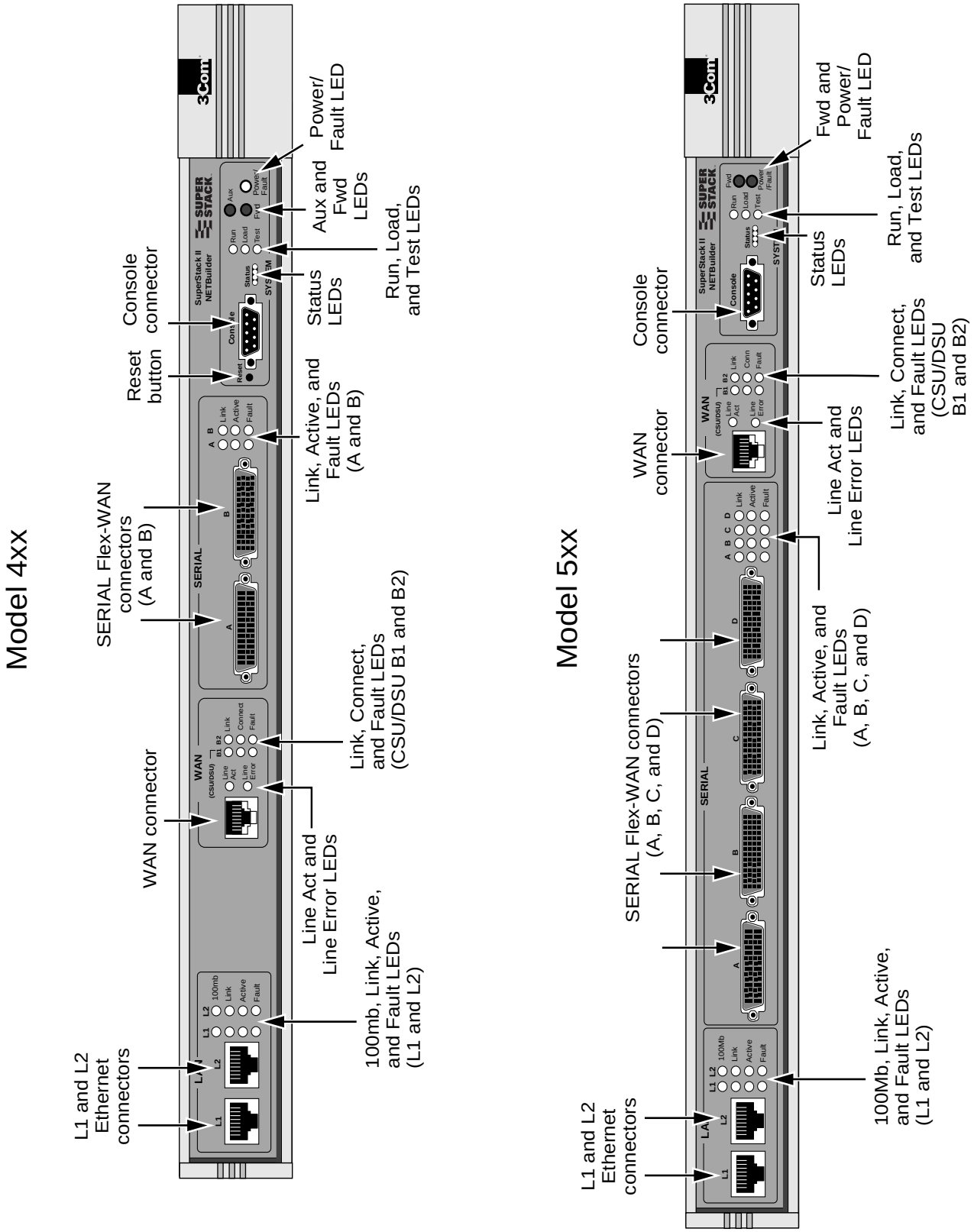
Figure 2 Models 4xx and 5xx Chassis Front Panel



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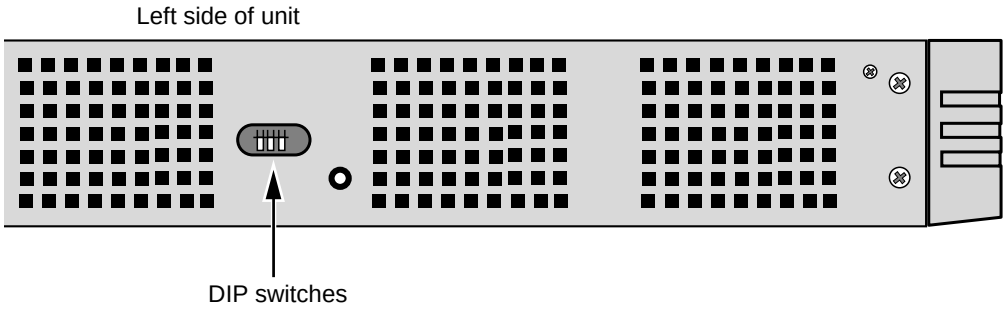
DIP Switches

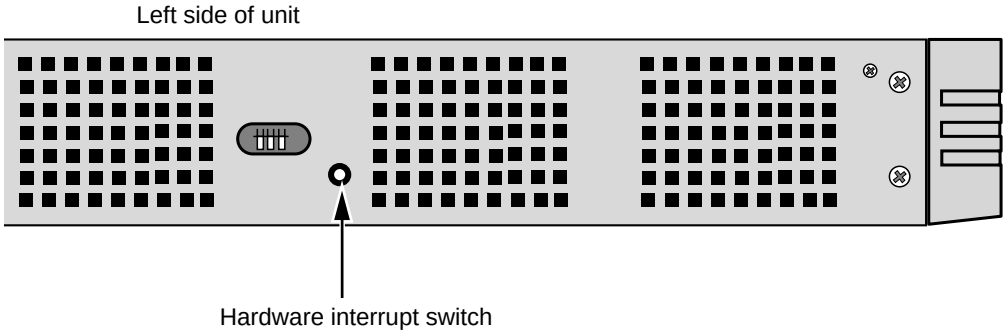
DIP switches are located on the left side of the bridge/router (when facing the front panel) and are for 3Com use only.

CAUTION: *To avoid accidentally erasing your flash memory or reinitializing the EEPROM, make sure all switches are in the down position.*



Hardware Interrupt Switch

The hardware interrupt switch is located on the left side of the bridge/router (when facing the front panel). It is recessed into an opening near the DIP switches. Press the switch with a nonconductive object, such as a plastic stylus, to activate the monitor firmware utility.



WARNING: *Use only a nonconductive object, such as a plastic stylus, to press the hardware interrupt switch. Do not use the tip of a pencil. Graphite particles from the pencil may cause you to receive an electric shock and may damage components on the motherboard.*

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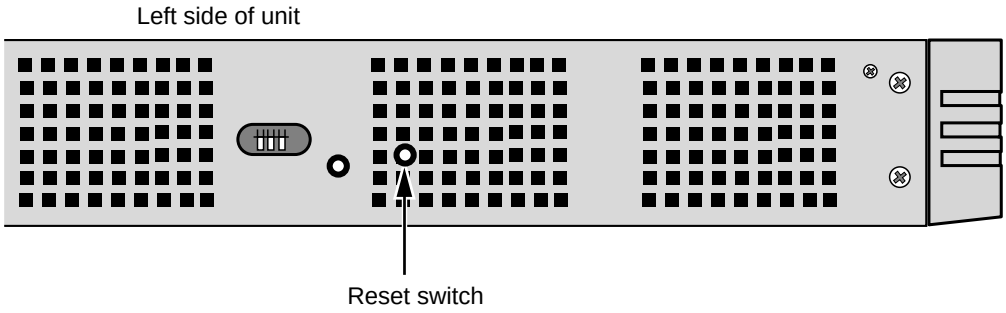
Reset Button

Pressing the Reset button resets the bridge/router. The reset button on the model 4xx bridge/router is on the front panel as shown in Figure 2. The reset button on the model 5xx bridge/router is on the left side of the bridge/router (when facing the front panel) as shown in Figure 3.

Figure 3 Reset Switch (Model 5xx)



Serial Device Requirements

Serial devices using the V.25bis command set over a SuperStack II bridge/router must support:

- High-level data link control (HDLC) with NRZ.
- CRN command.
- 8 (data bits), N (no parity), and 1 (stop bit) if a parity option is provided.
- V.25bis addressed mode.
- Synchronous data and DTE connection. The SuperStack II NETBuilder bridge/router does **not** support an asynchronous serial connection.

Serial devices using the DTR command set over a SuperStack II bridge/router RS-232 interface must support:

- DTR State to Dial: HIGH.
- DTR State Hangup: Low.
- DTR State Answer: HIGH.
- Synch Data Xmt (synchronous data and DTE connection). The SuperStack II NETBuilder bridge/router does **not** support an asynchronous serial connection.
- Auto Answer mode.
- User-stored phone number.

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2 USING THE BRIDGE/ROUTER IN YOUR NETWORK

This chapter gives an overview of SuperStack II NETBuilder SI bridge/routers and describes how they fit in your network. It also describes the software features of the bridge/router.

Overview

SuperStack II bridge/routers maintain connectivity among small, midsize, and large branch offices and the corporate LAN.

SuperStack II NETBuilder SI bridge/routers come with two Ethernet ports, two or four serial ports, and one of the following WAN ports: ISDN S/T (models 43x and model 53x), ISDN U (models 44x and 54x), 56/64 Kbps Carrier Service Unit/Data Service Unit (CSU/DSU) (models 45x and 55x), or T1/FT1 Telco port (models 46x and 56x). You can change any model 4xx bridge/router to another model 4xx, or any model 5xx to another model 5xx, by installing, removing, or replacing an interface module.

All models can be upgraded to any software package. All models have dual-image software support for upgrading and backup.

Using Ethernet LAN Ports

The SuperStack II NETBuilder SI bridge/router provides connection to two Ethernet LANs using either 10BASE-T or 100BASE-TX Ethernet. Boundary router models have one port disabled. If you upgrade to full router software, the second port will be functional.

Leaf node Boundary Routing® is not available on the model 5xx bridge/routers.

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Using WAN and Serial Ports

SuperStack II NETBuilder SI bridge/routers come with two or four serial ports and one of the following WAN ports: a built-in ISDN S/T terminal adapter (TA) (models 43x and 53x), a built-in ISDN U TA (models 44x and 54x), a built-in 56/64 Kbps CSU/DSU (models 45x and 55x) or a built-in T1/FT1 Telco port (models 46x and 56x).

ISDN Port (Model 43x, 53x, 44x and 54x)

The ISDN port provides a basic rate interface (BRI). The BRI delivers two bearer (B) channels and one delta (D) channel. Each B channel can transmit up to 64 kilobits per second (kbps); the D channel transmits information about the call to computers at the switching system at a rate of 16 kbps. You can use both B channels together for a combined data rate of 128 kbps, or use each 64 kbps B channel separately.

Some ISDN lines support up to 56 Kbps per B channel. For more information, contact your ISDN service provider.

Order ISDN lines from the phone company. See Appendix E for more information about ordering ISDN lines.

Installations in Hong Kong should be configured to originate and receive ISDN calls at 64 Kbps. Due to the variety of ISDN switches in the Hong Kong Telcom network, the SuperStack II NETBuilder SI bridge/router does not handle rate adapted ISDN calls at 56 Kbps properly.

56/64K CSU/DSU Port (Model 45x and 55x)

A CSU/DSU is equivalent to a modem for a digital line. The 56/64K CSU/DSU port connects directly to a Digital Data Service (DDS).

Order DDS lines from the phone company. Contact your phone company for more information about DDS lines and the services available for them.

T1/FT1 CSU/DSU Port (Model 46x and 56x)

A CSU/DSU is equivalent to a modem for a digital line. The T1/FT1 CSU/DSU port connects directly to a T1 line or a fractional T1 line. Fractional T1 consists of 24 channels (DS0s) at 64 Kbps each, so you can connect to one or more DS0s with the T1/FT1 port.

Order T1 lines from the phone company. Contact your phone company for more information about T1 lines and the services available for them.

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Serial Ports

The serial ports are multifunction Flex-WAN ports that provide connection to industry-standard V.35, RS-232, RS-449, RS-530, or X.21 Data Communications Equipment (DCE) or Data Terminal Equipment (DTE) serial devices. You can buy Flex-WAN cables separately from 3Com. See Appendix D for more information about Flex-WAN cables.

If you are using two SuperStack II NETBuilder SI bridge/routers connected directly to each other by the serial ports (back-to-back), the bridge/routers do not meet radiated emissions specifications.

For boundary routers, only one serial or WAN port can be active. The remaining ports are used for back-up only.

Telco Services

To create a WAN, you must buy lines and services from a telecommunications company (Telco). Services include dial-up lines, leased lines, and packet-switched services.

Dial-up lines, like ISDN, allow you to dial your destination when necessary and hang up when you no longer need the connection. A *leased* line is always available between two locations. Dial-up and leased lines both use the Point-to-Point Protocol (PPP).

Packet-switched services, like Frame Relay, use a combination of leased or dial-up lines with Telco-owned switching, which frees you from the cost of owning the line the entire length.

Table 4 describes dial-up and leased line services available for the WAN and serial ports. Table 5 describes packet-switched services.

Table 4 Dial-Up and Leased Line Services

Telco Line	Protocol	Serial Device (Required on Flex-WAN Serial Ports)	Data Transfer Rate
Dial-Up Lines:			
Plain Old Telephone Service (POTS)	PPP	Modem	Up to 56 Kbps
ISDN BRI	PPP	TA	2 channels up to 64 Kbps each*
Switched 56	PPP	CSU/DSU	56 Kbps
Leased Lines:			
E1	PPP	CSU/DSU	2.048 Mbps
T1	PPP	CSU/DSU	1.544 Mbps

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Table 4 Dial-Up and Leased Line Services

Telco Line	Protocol	Serial Device (Required on Flex-WAN Serial Ports)	Data Transfer Rate
Fractional T1	PPP	CSU/DSU	Up to 24 channels (DS0s) at 64 Kbps each
Digital Data Service (DDS)	PPP	CSU/DSU	Up to 64 Kbps

* Some ISDN lines support up to 56 Kbps per B channel. For more information, contact your ISDN service provider.

Table 5 Packet-Switched Services

Packet-Switched Services/Protocol	Telco Line	Serial Device (Required on Flex-WAN Serial Ports)	Data Transfer Rate
X.25	POTS	Modem	Up to 56 Kbps
Frame Relay	Leased line	CSU/DSU	Up to 2.048 Mbps
SMDS	Leased line	CSU/DSU	Up to 2.048 Mbps

Using PPP on Dial-Up and Leased Lines

All dial-up and leased lines use PPP. If you want to use multiple lines or channels to connect to the same destination, you can use Multilink PPP. Multilink PPP is especially useful for ISDN, as described in the following section.

ISDN ISDN consists of two bearer (B) channels and one delta (D) channel. Each B channel can transmit up to 64 Kbps; the D channel transmits signaling information about the call to computers at the switching system at a rate of 16 Kbps.

With Multilink PPP, you can use both B channels together for a combined data rate of 128 Kbps. With PPP, you can use each 64 Kbps B channel separately.

Some ISDN lines support up to 56 Kbps per B channel. For more information, contact your ISDN service provider.

Using Packet-Switched Network Services

You can use packet-switched services with your bridge/router instead of dial-up or leased lines to take advantage of high performance for a reasonable price. This section describes X.25 and Frame Relay.

X.25 An X.25 packet-switched network is defined by the International Telecommunications Union (ITU) *Recommendation X.25*, a global standard that began development in the 1970s. The recommendation

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defines a point-to-point interaction between DTEs and DCEs. In simpler terms, when it is time to transmit data, a terminal connects to a modem or packet switch, which then connects to packet switching exchanges (PSEs) and other DCEs to transmit the data to its final destination at another terminal. The links by which data is transmitted are called *virtual circuits*. Virtual circuits allow data transfers between two points on the network through any number of nodes in the network.

Frame Relay Frame Relay provides a packet-switched network that transfers data between DTEs, which can be routers, bridges, and host computers, by creating virtual circuits and using DCEs to transfer the data to its destination.

Frame Relay differs from X.25 (which was developed to work over voice-grade telephone lines) because it was designed to make use of today's higher speed digital lines. Frame Relay has also been designed to work within complex internetworking environments with extensions referred to as the *local management interface* (LMI).

LMI provides information about all devices that are accessible on the Frame Relay network by listing all *data link connection identifiers* (DLCIs) connecting the local system with the remote ones. The LMI improves reliability between the DTE and DCE through frequent exchange of keepalive packets that contain status information.

IBM Legacy Networks

Each serial port can be attached directly with a Flex-WAN cable to IBM legacy equipment like mainframes and automatic teller machines. See Table 4 for supported IBM protocols.

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3 INSTALLING THE HARDWARE

This chapter describes how to install your SuperStack II NETBuilder SI bridge/router.

Required Equipment

Table 6 lists the items you receive in the shipping carton and items you need to provide.

Table 6 Equipment Received and Equipment Needed

Shipping carton contents	■ SuperStack II NETBuilder SI bridge/router ■ Power cable ■ Models 44x and 54x: ISDN U cable ■ Models 45x, 55x, 46x and 56x: CSU/DSU loopback plug ■ Rack-mount kit ■ Models 46x and 56x: RJ-48 T1 cable ■ Software CD-ROM* (except for boundary router models) ■ Documentation and documentation CD-ROM
What you need to provide	■ Synchronous serial devices like a channel service unit/digital service unit (CSU/DSU), modem, or ISDN TA. ■ NT1 for models 43x and 53x in the U.S. and Canada ■ Interface module (available from 3Com — optional) ■ 10BASE-T or 100BASE-TX network cables ■ Flex-WAN cables (available from 3Com). See "Serial Connectors and Flex-WAN Cables" on page 174 for more information about ordering Flex-WAN cables. ■ Models 43x and 53x: ISDN S/T cable ■ Models 45x and 55x: CSU/DSU cable ■ Terminal, PC, or modem and cable

* The software is preinstalled in the flash memory drive of the bridge/router and automatically loads when you turn on the power. The software CD-ROM is for software recovery purposes only.

WARNING: *To eliminate cable noise emission in excess of FCC regulations, part 15, subpart J, and EN55022B, all interconnection cables should be equipped with shielded connectors, the backshells of which must completely surround the cable shield.*

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For more information on cables, see Appendix D.

Environmental Requirements

Table 7 provides the environmental requirements of the SuperStack II bridge/routers.

Table 7 Environmental Requirements

Parameter	Minimum Requirement	Maximum Requirement
Temperature		
Operating	5 °C	40 °C
Nonoperating	-40 °C	75 °C
Altitude		
Operating	15,000 ft	15,000 ft
Nonoperating	40,000 ft	40,000 ft
Relative Humidity		
Operating	10% noncondensing	90% noncondensing
Nonoperating	10% noncondensing	90% noncondensing

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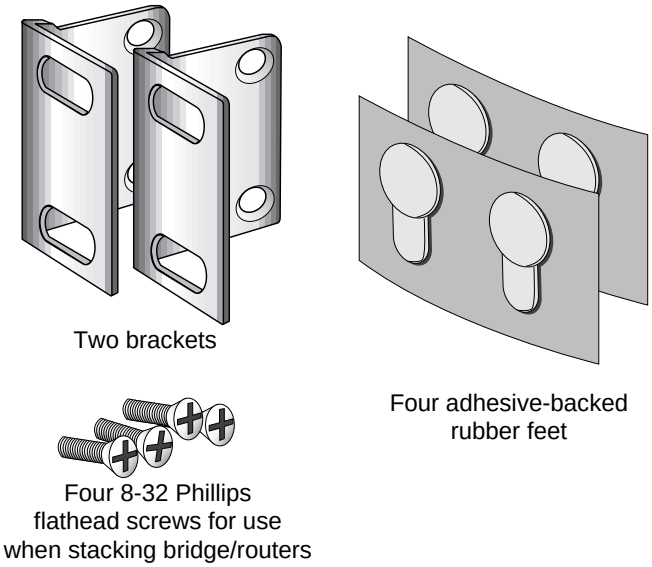
Mounting the Bridge/Router

You can mount your bridge/router on a tabletop, stack several with brackets, or mount the bridge/router in a rack.

Mounting Kit

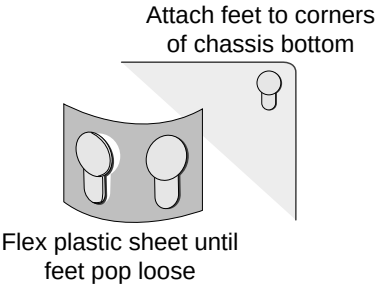
The mounting kit contains the following hardware:

Figure 4 Mounting Kit Contents



Installing on a Tabletop

If you plan to install your bridge/router on a tabletop, attach the rubber feet as shown.



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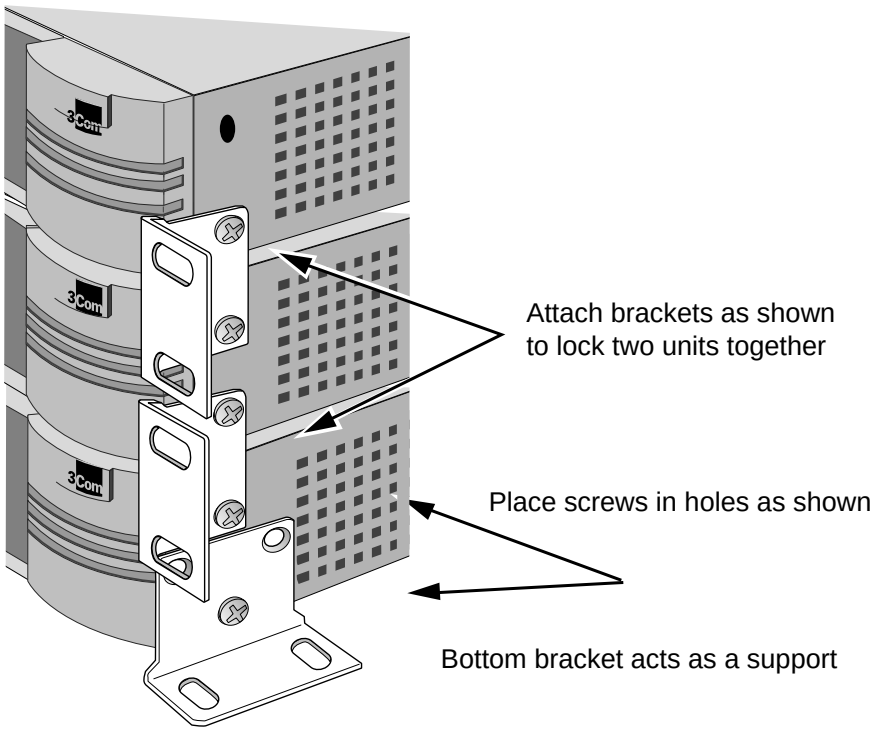
Stacking with Brackets

See Figure 5 to securely stack several bridge/routers on a tabletop.

CAUTION: Do not restrict air flow around the sides and back of the bridge/router.

Figure 5 Stacking Bridge/Routers



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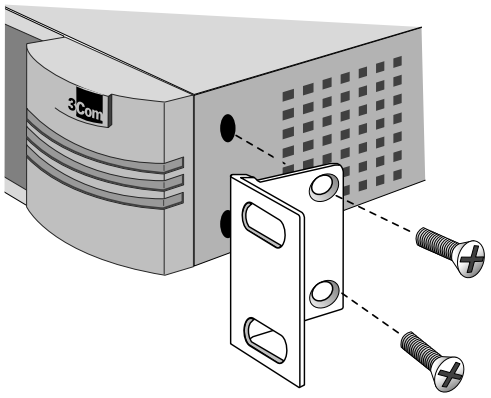
Installing in a Rack

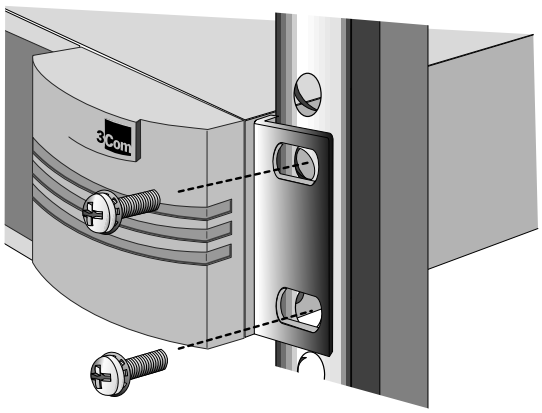
To install the bridge/router in a rack, follow these steps:

CAUTION: *Do not restrict air flow around the sides and back of the bridge/router.*

1 Secure the rack-mount brackets to each side of the chassis using two flathead screws per bracket.



2 Hold the chassis between the poles of the rack and attach the brackets to the rack using panhead screws (you must provide these screws). Tighten each screw securely.



CAUTION: *Using fewer than two screws to secure the brackets to the rack may cause the boundary router to fall and sustain damage not covered by the warranty.*

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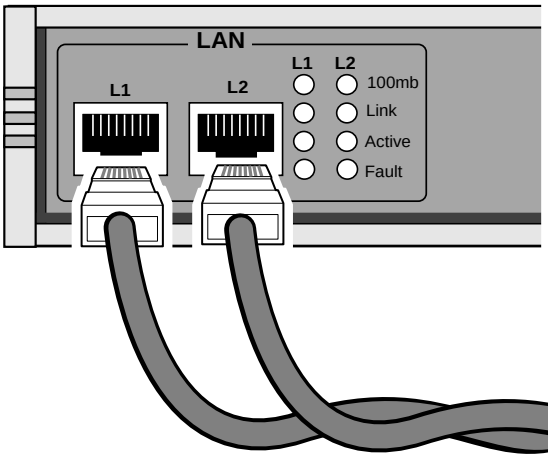
Cabling the Connectors

The SuperStack II NETBuilder SI bridge/router has two Ethernet ports, either two or four serial ports depending on the model, and one of the following WAN ports: ISDN S/T (43x and 53x), ISDN U (44x and 54x), 56/64 Kbps CSU/DSU (45x and 55x), or T1/FT1 CSU/DSU (46x and 56x). This section describes how to cable each port on your bridge/router.

Boundary router models can use only one Ethernet port and only one serial or WAN port can be active at a time. You can cable the remaining serial or WAN ports to be used as back-up. If you upgrade to full router software, the second Ethernet port and back-up serial ports will be functional.

Cabling the LAN Connectors

You can cable one or two Ethernet connectors using either 10BASE-T or 100BASE-TX cabling. If you have a boundary router, cable only the L1 connector.



10BASE-T or 100BASE-TX cables

For more information about Ethernet connectors and cables, see “LAN Connector and Cables” on page 165.

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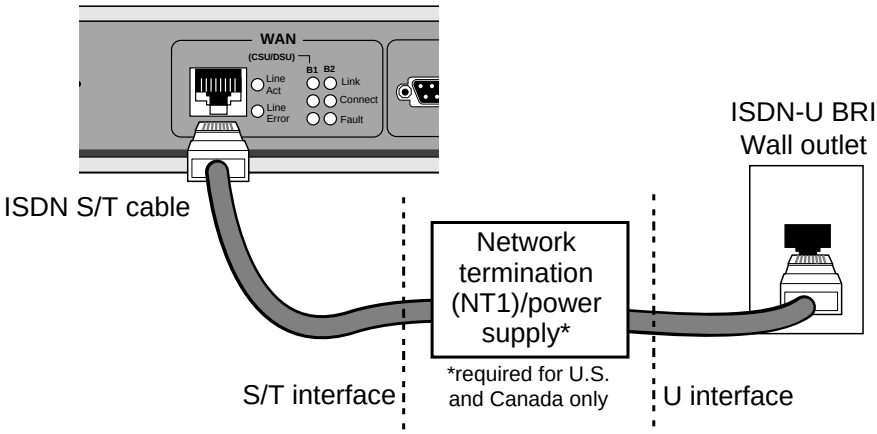
Cabling the WAN Connector

This section describes the WAN connector for each bridge/router model.

Model 43x and 53x ISDN S/T

Models 43x and 53x bridge/routers have an ISDN S/T connector.

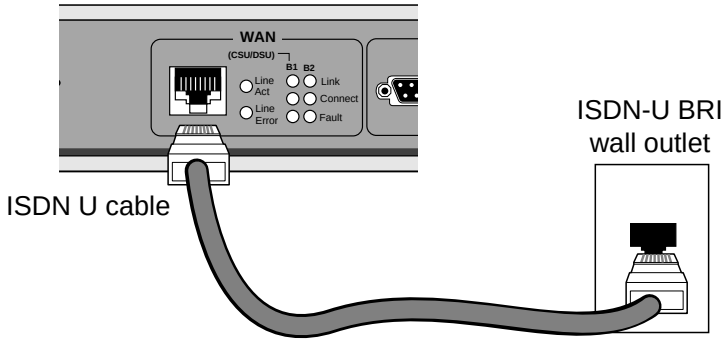


The ISDN S/T port uses an RJ-45 connector. In the U.S. and Canada, purchase an NT1 from an ISDN equipment vendor, and use it between the bridge/router and the ISDN outlet. In other countries, you do not need to provide an NT1 because the function is provided by the ISDN equipment at the customer site.

For more information on ISDN cables, see "ISDN S/T Cable" on page 170.

Model 44x and 54x ISDN U

Models 44x and 54x bridge/routers have an ISDN U connector.



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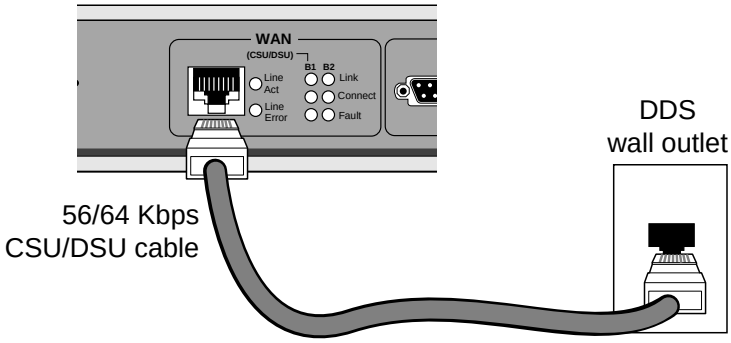
The ISDN U port uses an RJ-45 connector. In the U.S. and Canada, you do not need a separate NT1 between the bridge/router and the ISDN outlet because the NT1 is built into the model 44x bridge/router.

For more information on ISDN cables, see "ISDN S/T Cable" on page 170.

Model 45x and 54x 56/64K CSU/DSU

Models 45x and 55x bridge/routers have a 56/64K CSU/DSU connector.

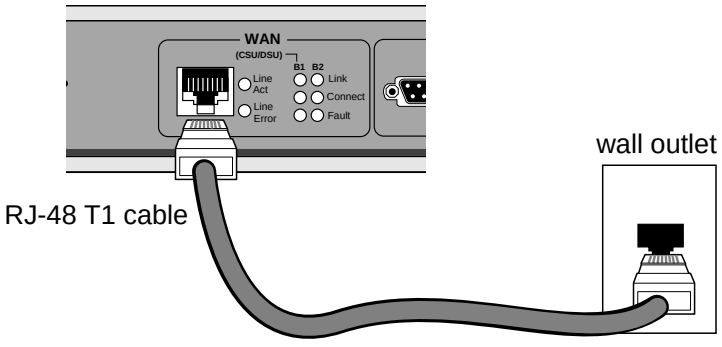


The 56/64K CSU/DSU port uses an RJ-48S connector.

For more information on CSU/DSU cables, see "56/64K CSU/DSU Cable" on page 173.

Model 46x and 56x T1/FT1

Models 46x and 56x bridge/routers have a T1/FT1 RJ-48 connector.



The T1/FT1 Telco port uses an RJ-48 connector.

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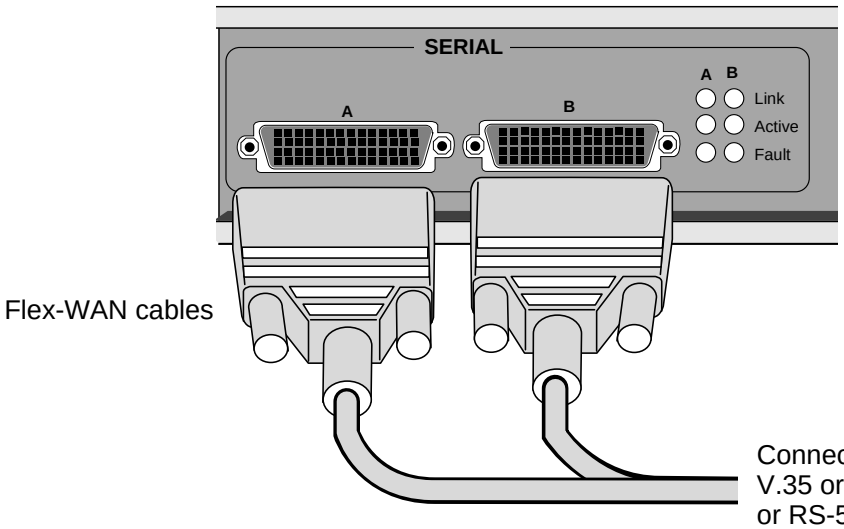
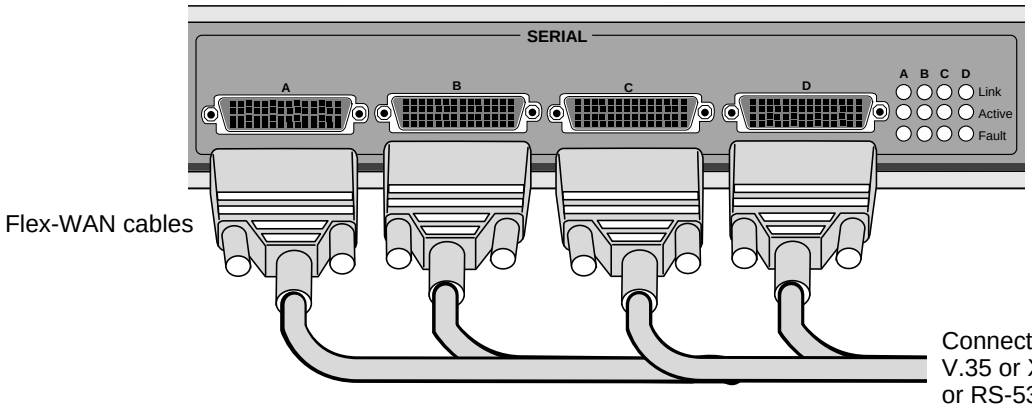
Cabling the Serial Connectors

The SuperStack II bridge/router has either two or four Flex-WAN serial connectors depending on the model. Order the appropriate Flex-WAN cable from 3Com for your serial device. See "Serial Connectors and Flex-WAN Cables" on page 174 for more information about the Flex-WAN cables.

Model 4xx



Model 5xx



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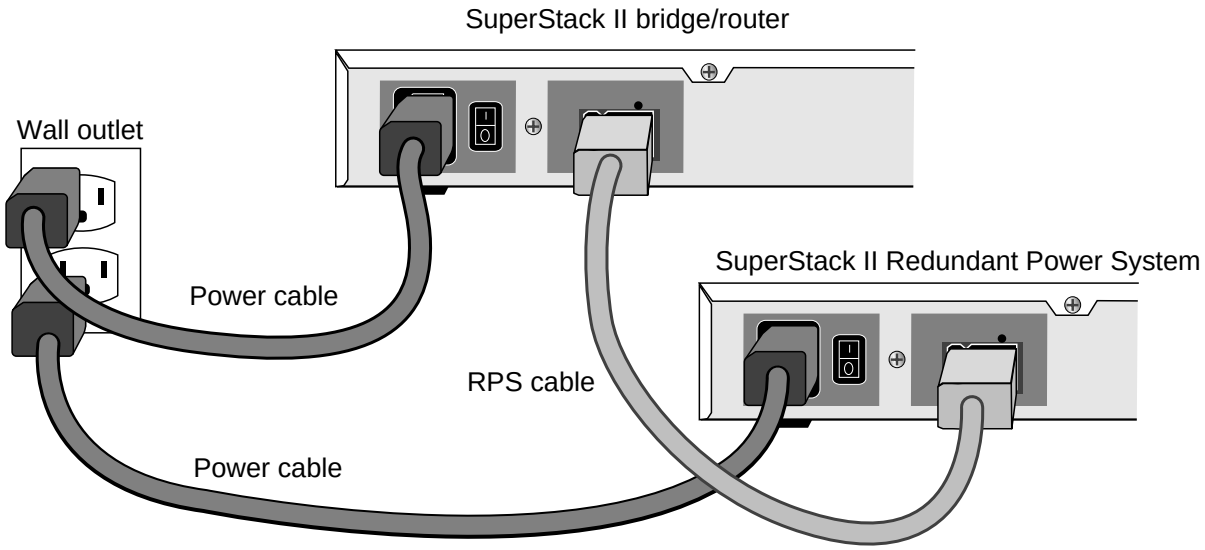
Attaching a Redundant Power System

You can attach your SuperStack II bridge/router to a SuperStack II Redundant Power System (RPS).



For full power supply redundancy, attach one end of the RPS cable to the rear panel on the bridge/router and the other end to the RPS. Then attach one end of the power cord to the rear panel on the bridge/router and the other end to a power outlet.

In this configuration, the internal supply provides power. If the internal supply fails or is switched off, or if there is a power failure, the RPS is activated and the bridge/router reboots.

To reset a bridge/router in this configuration, turn the power off, wait 5 seconds and turn it back on. The bridge/router switches to the RPS, then switches back to the internal supply to reboot.

CAUTION: *For system susceptibility protection, always leave the AC cord attached to the bridge/router and to a power outlet.*

Internal power supply failure is rare. If it occurs, the power switch on your bridge/router will not operate. To reboot, unplug the RPS cable and then plug it back in. Replace your bridge/router with another bridge/router that has a functioning internal power supply as soon as possible. Contact your 3Com representative to replace your bridge/router.

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Connecting a PC, Terminal, or Modem

Connect a PC running a terminal emulation program, a terminal, or a modem to the console port on the SuperStack II bridge/router to configure the bridge/router software and review startup and system operation messages.

To connect a PC, terminal, or modem to the bridge/router, follow these steps:

1. Obtain a cable to connect the device to the console port on the bridge/router. See "Console Connector and Cables" on page 163 for cable pinouts.

   The console port is a 9-pin male connector.

   For the PC, use a 9-pin female to 9-pin female null modem-type cable.

   For the terminal, use a 9-pin female to 25-pin null modem-type cable.

   For the modem, use a 9-pin female to 25-pin male straight-through-type cable.

2. Connect one end of the cable to the console port on the SuperStack II system and the other end to the serial port on the back of your device.

3. Verify that configurable parameters of your device match the configuration settings of the console port specified in Table 8.

   Table 8 Console Port Configuration Settings

Characteristic	Setting
Baud rate	9600
Databits	8
Parity	None
Stop bits	1
DTR	Ignored
Duplex	Full
Echo	Off
Flow control	X-on/X-off

4. Turn on the device.

Shutting Down

If your SuperStack II system is not connected to an RPS, turn off the power by pressing the off (0) side of the power switch on the back panel. If your system is connected to an RPS, turn off the power by unplugging the RPS cable from the system and then pressing the off (0) side of the power switch.

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4 Installing or Removing an Interface Module

This chapter describes how to install or remove interface modules in SuperStack II NETBuilder SI bridge/routers.

The following table lists each model number and the interface module it contains.

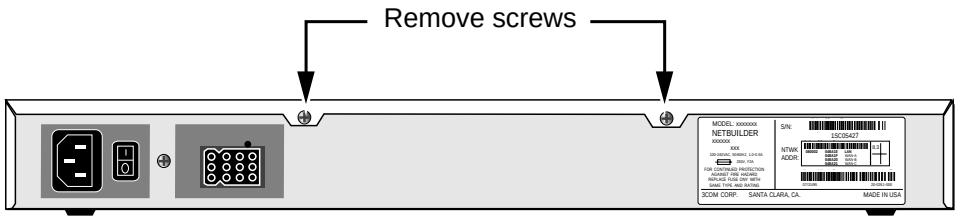
Model	Module Installed
43x/53x	ISDN S/T port with no interface module
44x/54x	ISDN U interface module
45x/55x	56/64 Kbps CSU/DSU module
46x/56x	T1/FT1 CSU/DSU module

You can change any model 4xx bridge/router to another model 4xx, or any model 5xx bridge/router to another model 5xx bridge/router by installing, removing, or replacing the interface module.

Removing the Cover

To remove the cover, follow these steps:

1. Remove the power cord and all cables from the chassis.
2. If the bridge/router is mounted with brackets, unmount it and remove the brackets.
3. Remove the two screws from the back of the chassis.



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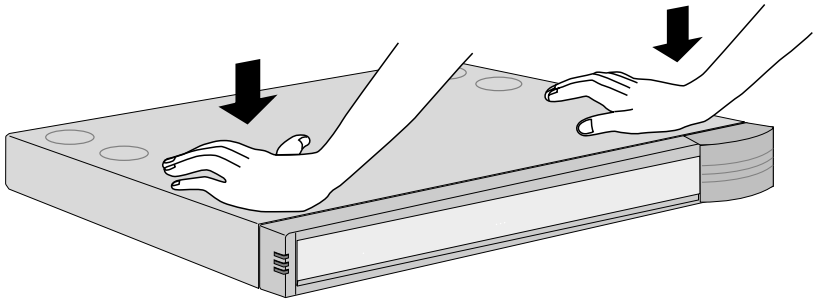
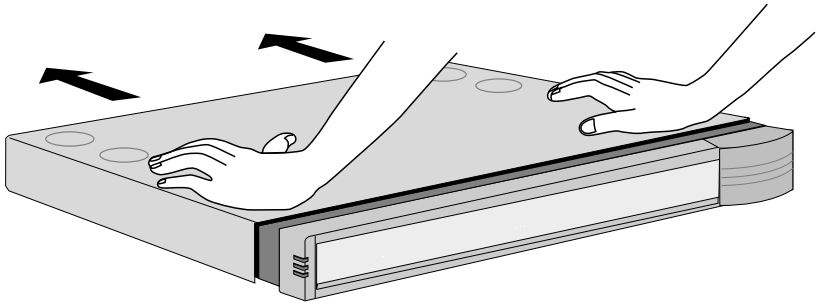
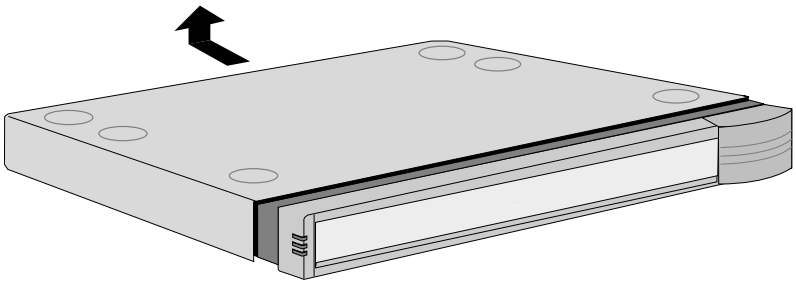
4 Remove the cover.



With the front panel facing you, push down on cover with both hands



Slide cover back slightly



Lift cover away from chassis

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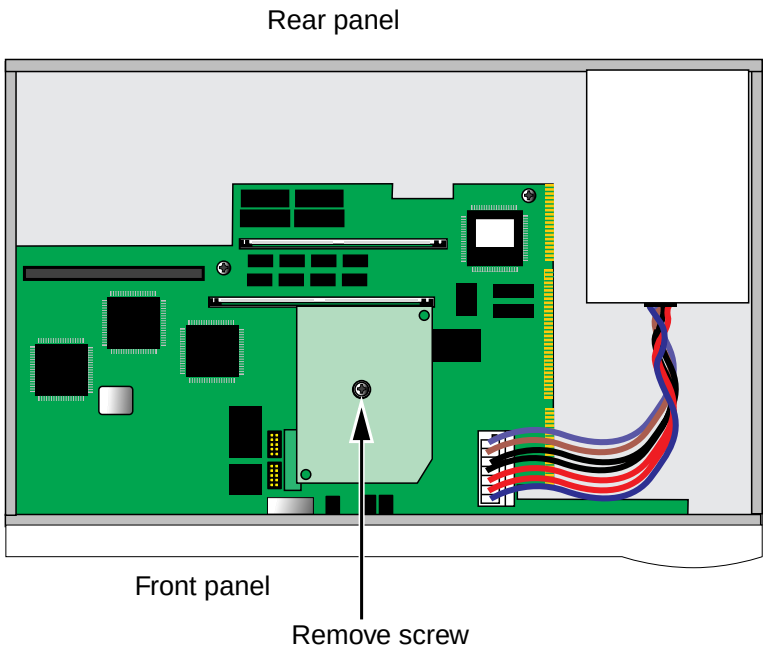
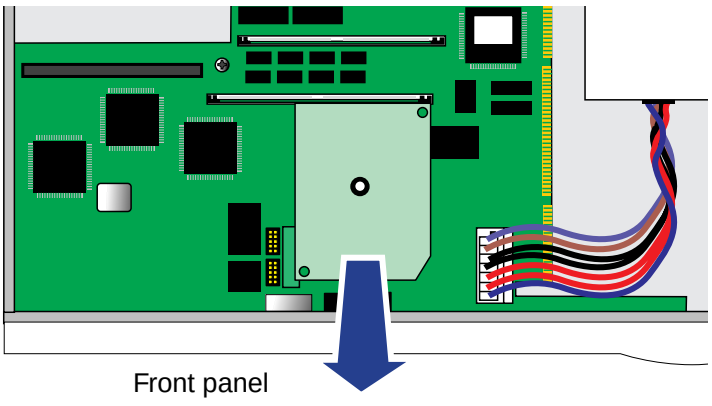
Removing an Existing Module (Model 4xx)

To remove an existing module from a model 4xx bridge/router, follow these steps:

1 Remove the screw from the standoff.



2 Remove the module.



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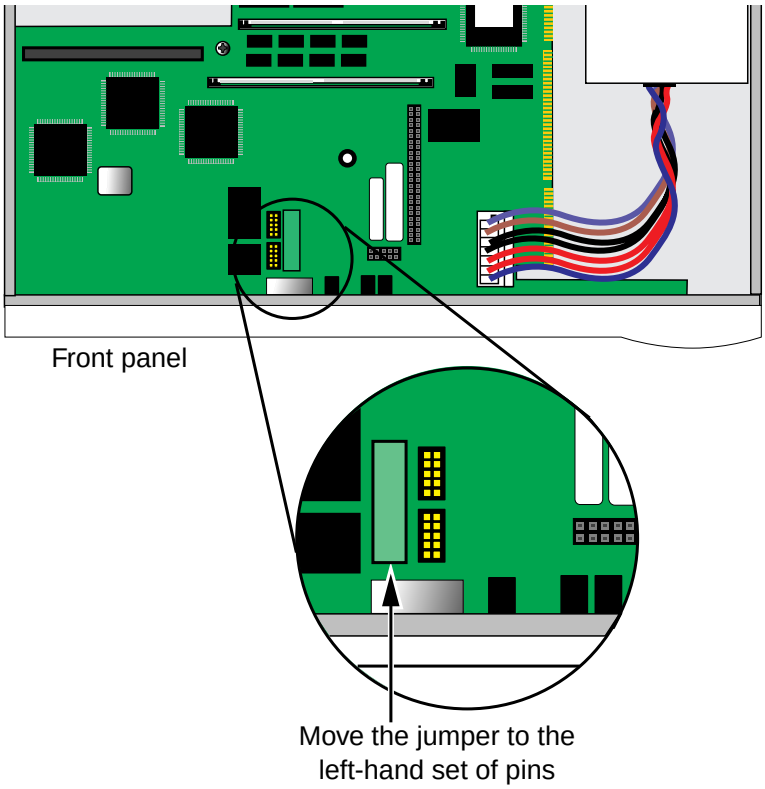
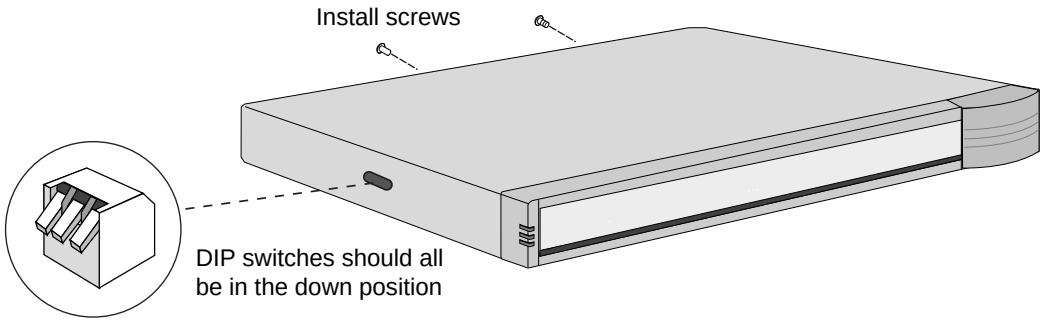
3 If you are not installing another module, change the jumper to the left-hand set of pins and reinstall the screw on the standoff.



4 Reinstall the cover and the cover screws.

CAUTION: *The DIP switches should all be in the down position. The DIP switches are accessible through an opening on the side of the chassis.*



5 If the bridge/router was mounted with brackets, reinstall the brackets and remount it.

6 Reconnect the power cord and all cables.

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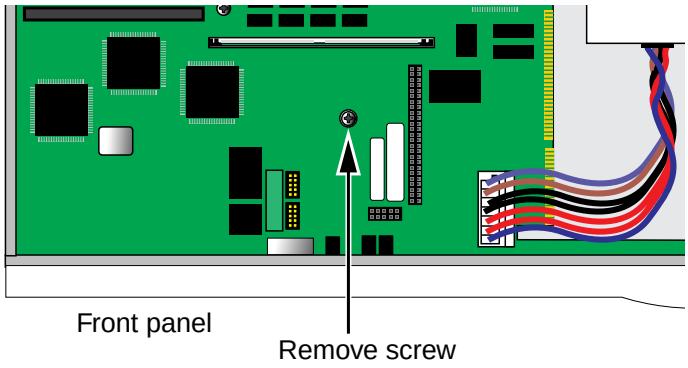
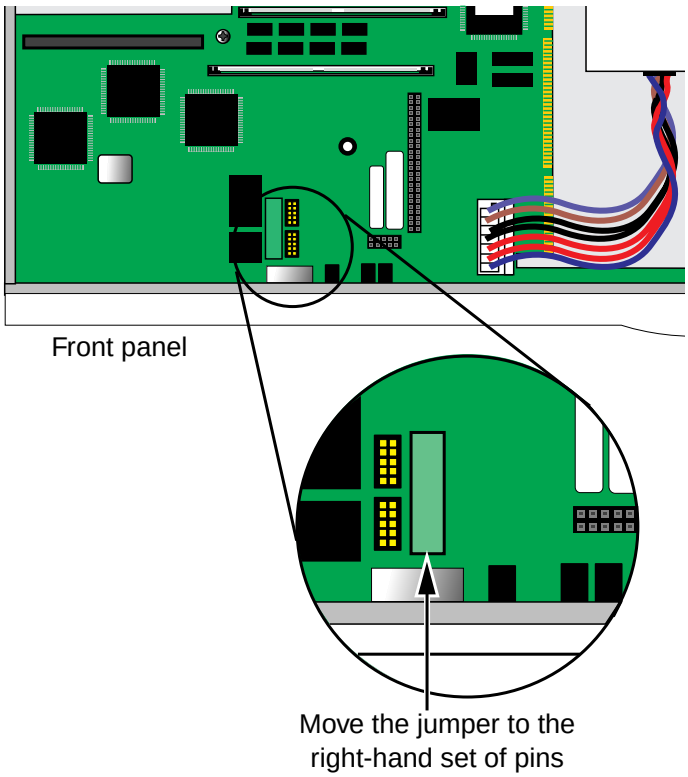
Installing a New Module (Model 4xx)

To install a new module in a model 4xx bridge/router, follow these steps:

1 Remove the screw from the standoff if necessary.



2 Move the jumper to the right-hand set of pins.



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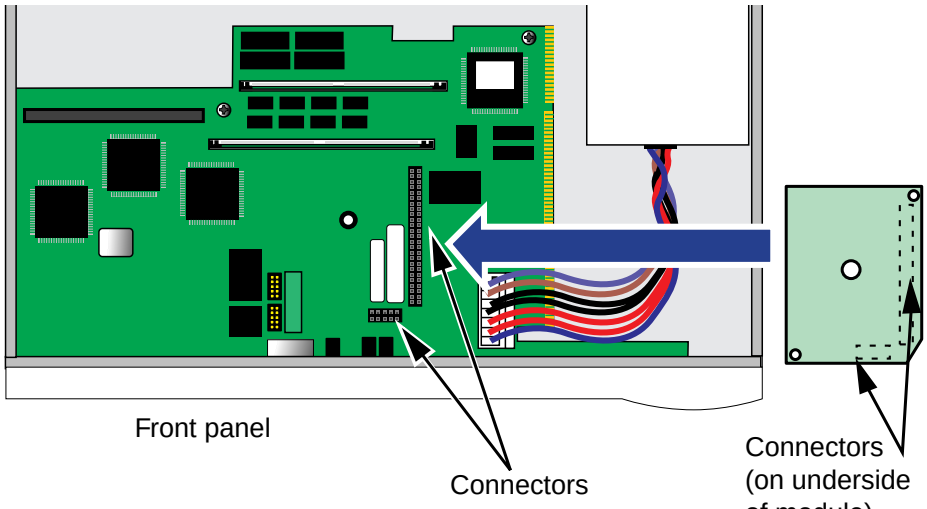
3 Insert the new module.

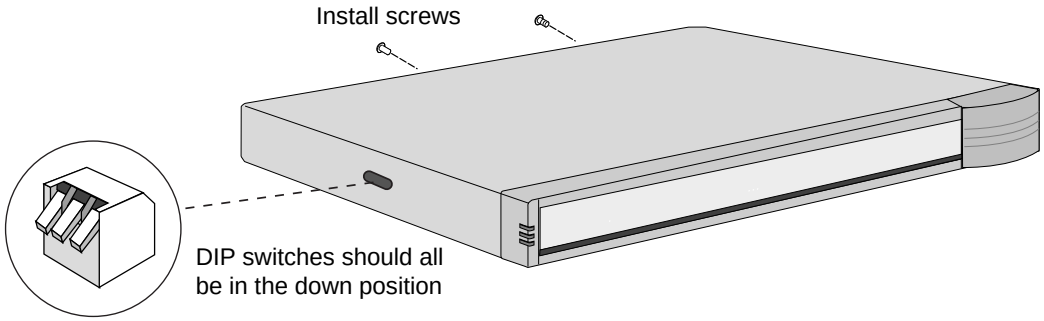


Install module by matching connectors

4 Reinstall the screw on the standoff.

5 Reinstall the cover and the cover screws.

CAUTION: *The DIP switches should all be in the down position. The DIP switches are accessible through an opening on the side of the chassis.*



6 If the bridge/router was mounted with brackets, reinstall the brackets and remount it.

7 Reconnect the power cord and all cables.

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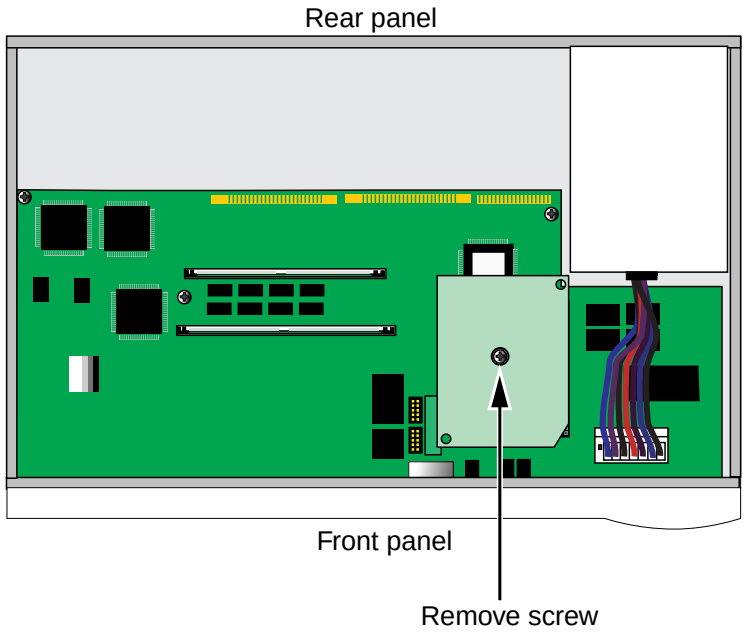
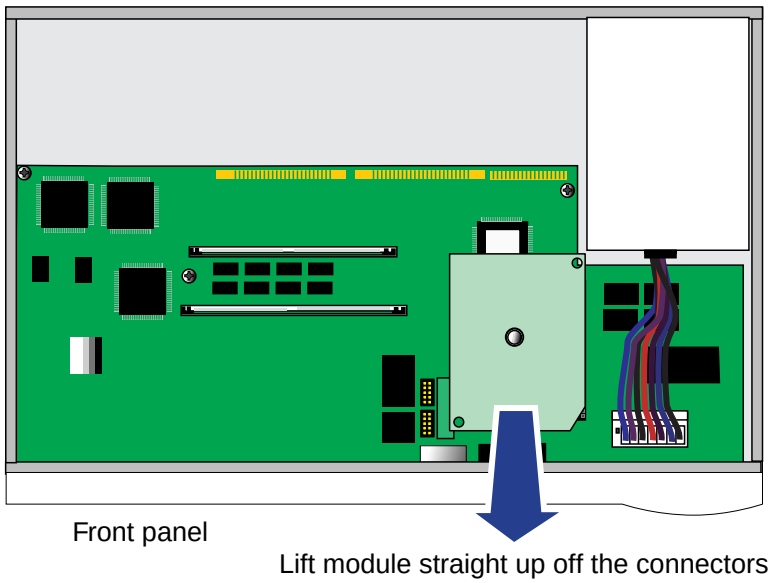
Removing an Existing Module (Model 5xx)

To remove an existing module from a model 5xx bridge/router, follow these steps:

1 Remove the screw from the standoff.



2 Remove the module.



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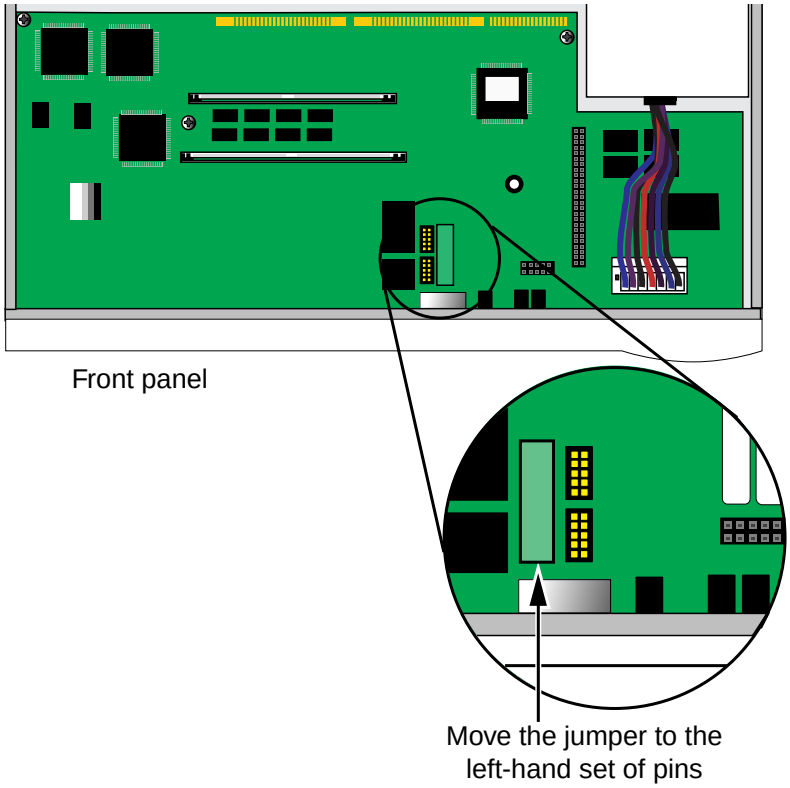
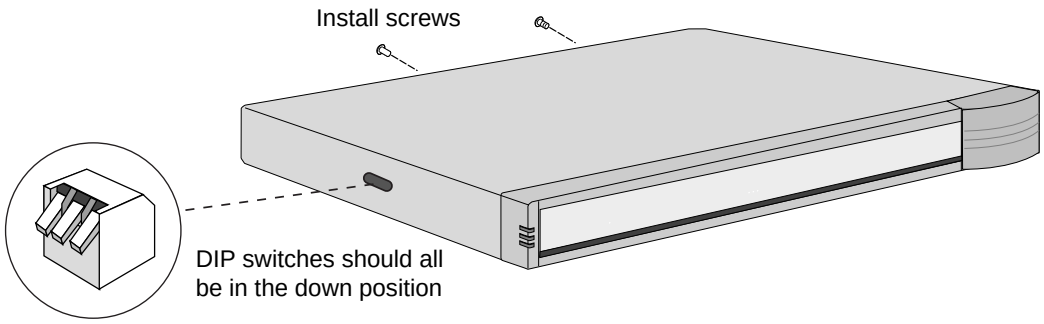
3 If you are not installing another module, change the jumper to the left-hand set of pins and reinstall the screw on the standoff.



4 Reinstall the cover and the cover screws.

CAUTION: *The DIP switches should all be in the down position. The DIP switches are accessible through an opening on the side of the chassis.*



5 If the bridge/router was mounted with brackets, reinstall the brackets and remount it.

6 Reconnect the power cord and all cables.

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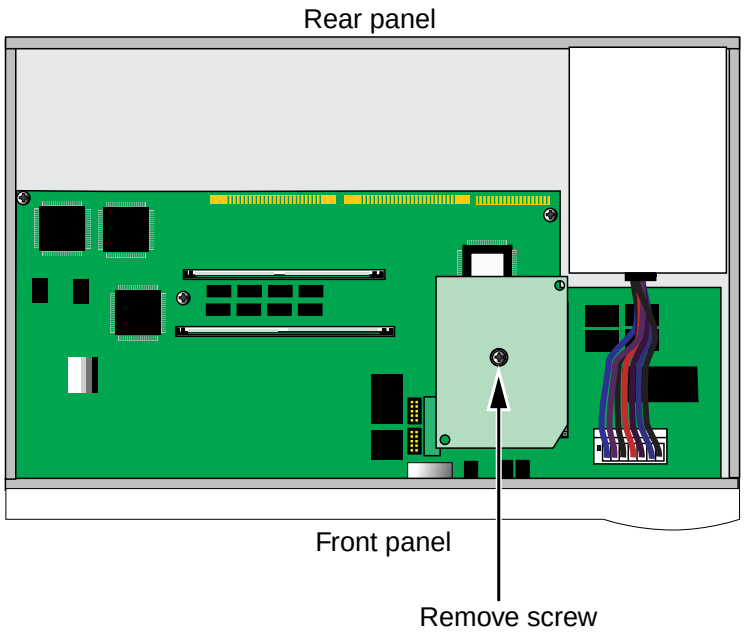
Installing a New Module (Model 5xx)

To install a new module in a model 5xx bridge/router, follow these steps:

1 Remove the screw from the standoff if necessary.



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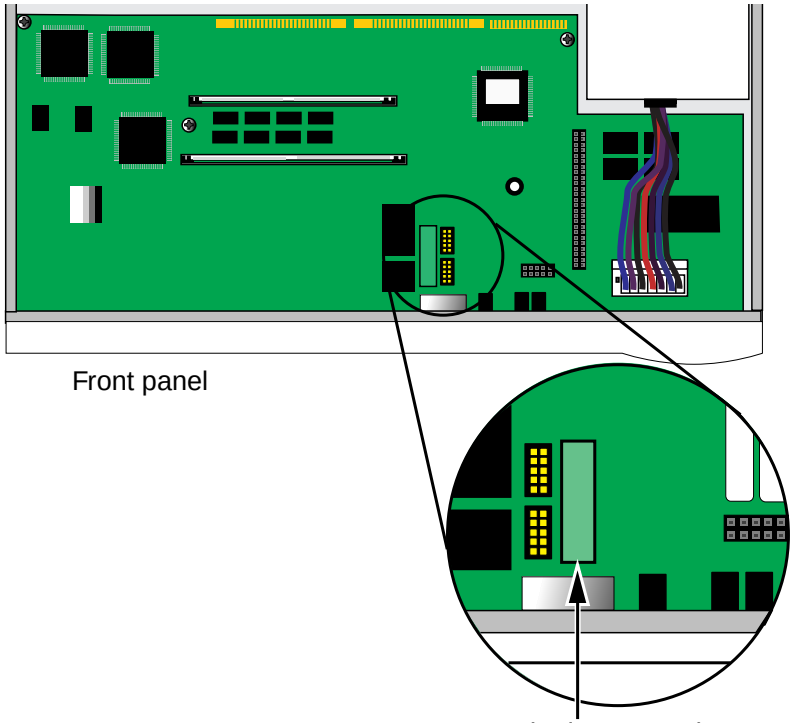
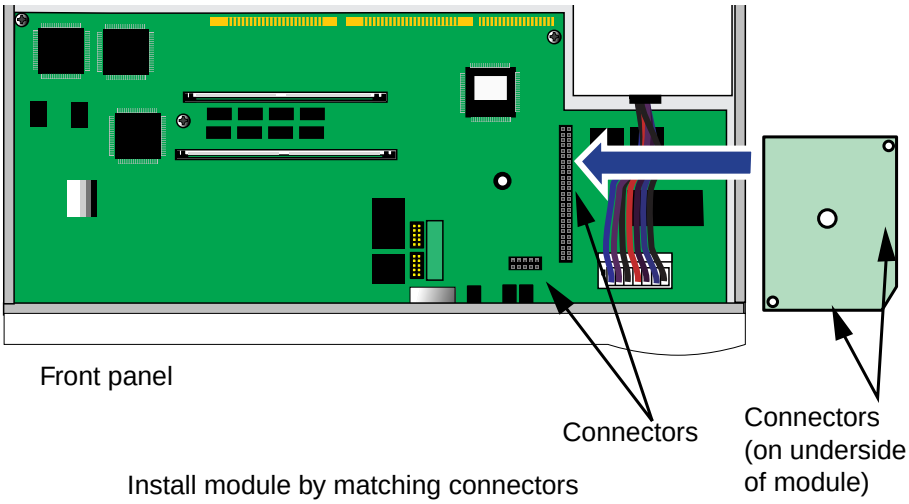
2 Move the jumper to the right-hand set of pins.



3 Insert the new module.



Install module by matching connectors

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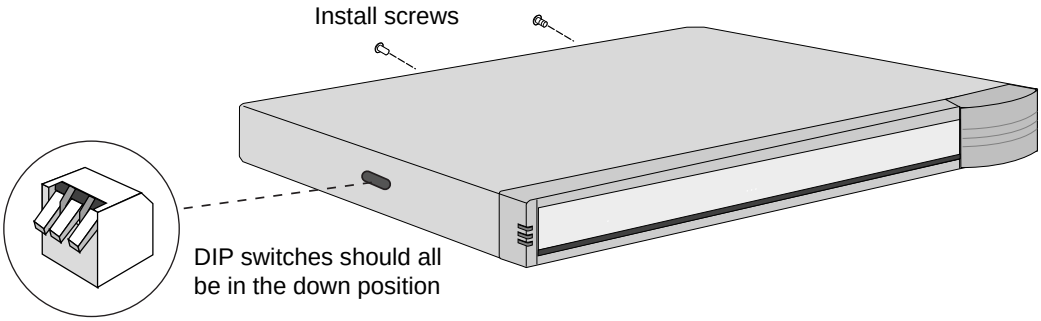
4 Reinstall the screw on the standoff.

5 Reinstall the cover and the cover screws.

CAUTION: *The DIP switches should all be in the down position. The DIP switches are accessible through an opening on the side of the chassis.*



6 If the bridge/router was mounted with brackets, reinstall the brackets and remount it.

7 Reconnect the power cord and all cables.

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5 LOGGING ON AND PERFORMING ADMINISTRATIVE TASKS

This chapter describes how to start up the system, log on, use the user interface, and perform basic administrative tasks that you must complete before configuring the ports and paths and bridging or routing protocols that you plan to run on your bridge/router.

Table 9 summarizes the administrative tasks described in this chapter and indicates whether performing each task is required, recommended, or optional.

Table 9 Administrative Task Summary

Task	Status of Task
Changing the Root Password	Required
Changing the Default Console Port Baud Rate	Do only if you want to attach a terminal with a baud rate other than 9600.
Adding User Accounts	Optional
Setting the Time and Date	Recommended
Setting System Information	Required
Setting Up Security	Recommended

For more information on each of the commands and parameters used in this section, see *Reference for Enterprise OS Software*.

Turning on the System

To start up your bridge/router, plug one end of the power cord into the rear panel of the bridge/router and the other end into your power outlet. In addition, if you have a SuperStack II Redundant Power System (RPS), attach one end of the RPS cable to the rear panel of the bridge/router and the other end to the RPS.

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Verifying Successful Startup

The startup process takes a few minutes. When the startup process has successfully completed, the LEDs on the front panel should be on or off as described in Table 10.

If the LEDs on your bridge/router appear different from those shown in Table 10, the bridge/router may have a problem. See Appendix A for more information.

Table 10 LED Status at Successful Startup

LED		Status
LAN		
	Link	On
	Active	On
	Fault	Off
WAN		
	Line Act	On
	Line Error	Off
	Link	On
	Connect	On
	Fault	Off
SERIAL		
	Link	On
	Active	On
	Fault	Off
SYSTEM		
	Status	All off
	Fwd	Off or blinking
	Power/Fault	Green
	Run	On
	Load	Off
	Test	Off
	AUX	Off

If the bridge/router is configured for an ETSI switch and there are no ISDN B channel connections, the ISDN Line Act LED is off. If a B channel is not connected, the Link and Connect LEDs are also off. The LED configuration shown in this figure occurs when all channels are connected.

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Attaching a Console

You must attach a console to the bridge/router for initial software configuration. For information about attaching a PC, terminal, or modem, see the hardware installation guide for the bridge/router.

After you have configured the software, you can access the user interface using one of the following methods:

- Telnet to the bridge/router from a device (for example, a workstation) on the same extended network or internetwork.

  The software supports Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). These protocols allow you to Telnet to the bridge/router using an Internet Protocol (IP) address. For more information about using Telnet on a workstation, see the manual that came with your Telnet application.

- Use Simple Network Management Protocol (SNMP) to view and configure a subset of the parameters from a remote host. For information on preparing the bridge/router to run SNMP, see *Using Enterprise OS Software*.

Logging on to the System

When your bridge/router starts up, it takes a few minutes to complete the initialization process. While the bridge/router is initializing, several messages appear on your terminal. The bridge/router has finished booting when the following message is displayed:

```
System Initialized and Running
```

To log on, follow these steps:

1. Press any key on the keyboard.

   The following prompt is displayed:

   ```
   NetLogin:
   ```

2. Enter:

   `root`

   Root is the default account name. The following prompt is displayed:

   ```
   Password:
   ```

3. Press the Return key.

   Pressing the Return key enters a null string, which is the default local password. The Network Manager prompt is displayed:

   ```
   Enterprise OS #
   ```

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Choosing the User Interface

This section describes how to access the menu-driven and command-line user interfaces. Detailed information for both types of interfaces is provided so that you can choose the one that best suits your needs.

Deciding which Interface to Use

After you have accessed the user interface, you need to decide whether to use the menu-driven or the command-line interface.

- If you are unsure of the command syntax, use the menu-driven interface.

  For more information about the MEnu command, see *Reference for Enterprise OS Software*. For information on how to use the menu-driven interface, see the next section.

- If you know the exact syntax, enter the command at the system prompt.

  For information about the command line and rules for entering commands, see Appendix C. To access the command-line, see "Using the Command-line Interface" on page 57. The syntax for each command and parameter is described in *Reference for Enterprise OS Software*.

Using Menus

The MEnu command allows you to:

- Display a list of available services.
- Choose a service and display the list of parameters available for that service.
- Display a list of parameters in the current service.
- Choose a parameter and display the commands used with it.
- Check the active and default values of a parameter.
- Display the online help syntax of a parameter.
- Enter the new value of a parameter.

The following prerequisites and notes apply when using the menu-driven interface:

- You must have Network Manager privilege.
- You cannot access some parameters; for example, you cannot alter the number of lines on the screen, or change privilege level.
- To access the SuperStack II system through the REMote command, you must use the command-line interface.

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To use the menu-driven interface, follow these steps:

1. Log on as root or as a user with Network Manager privilege (see "Adding User Accounts" on page 60 for more information about user accounts).
2. If you have not selected a particular service, enter:

   MEnu

   The Main menu display appears.
3. Select the desired service.

   For example, selecting 1 from the Main menu display generates a menu for the SYS Service.
4. Select the parameter you want to configure.

   For example, if you selected 27 from the SYS Service menu, a display appears for that parameter.

   The first part of the screen displays the value of the parameter. The second part lists the commands from which you can choose. For information on the help menus, see "Getting Help" on page 160. For the complete rules for entering commands and using aliases and history substitution, see "Using Aliases" on page 157 and "Command History Substitution" on page 158.
5. To escape out of a menu, press the Return key, which takes you to the previous menu level.

   For example, if you are at the Main menu and you press the Return key, you will return to the command-line interface.

Using the Command-line Interface

For information about the command line and rules for entering commands, see Appendix C.

To use the command-line interface, follow these steps:

1. Log on as root or as a user with Network Manager privilege (see "Adding User Accounts" on page 60 for more information about user accounts).
2. Type the command name. For a complete list of commands, enter a question mark (?).

   If your command does not require a service name, parameter, or values, skip to step 3. If your command requires more modification, continue to step a.

   a If the command has additional options, such as a port or path number, include it after the command name.

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When you include a specific port or path number in the command, that command focuses on that particular port or path. If the port or path number is not included, the command provides information on all ports or paths.

For more information on ports, paths, or commands, see *Reference for Enterprise OS Software*.

b If the command is modified by a parameter, type the service name (if necessary), the parameter name, and values.

The service part of the command focuses the action of the command on a particular service of the system.

In some cases, you may not need to enter the service name. For example, if a parameter is unique to a particular service, the service need not be specified as part of the command. For more information, see "Entering Service Names in Command Lines" on page 157.

The parameter is the object of the action of the command. If two or more services have parameters of the same name, you must include the service name in the syntax so the command can be executed successfully.

The value part of the command specifies how you want the parameter to be set. Values include numerics, strings, or addresses depending on the parameter.

3 Press the Return key after typing the complete command.

The software includes online help for commands, services, parameters, and syntax, and is described in "Getting Help" on page 160. The syntax style that appears in the online help is the full form syntax; it contains full names and visual cues for entering commands. You can also enter commands using an abbreviated version of the syntax style.

For more information on syntax, see Appendix C.

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Changing the Root Password

The default root password is a null string, which is generated by pressing the Return key.

You should specify a new password immediately after you log on for the first time. Changing the root password prevents unauthorized users from accessing and executing software commands and parameters.

The root user has two privilege levels and passwords: Network Manager and User. The User privilege enables only a subset of software commands. You should assign passwords for both levels. If you log in as root and enter the Network Manager password, you have Network Manager privilege. If you log in as root with the User password, you have User privilege.

You might log on with the User password if you do not want to create user accounts. If you want to change the privilege level without logging off, use:

```
SET -SYS PRIvilege = User | NetMgr
```

The following guidelines exist when changing a password:

- You must be logged on as root with Network Manager privilege.
- You must change the Network Manager password before you change the User password.
- You must clear the User password before you clear the Network Manager password.

To change the password for both privilege levels, enter:

```
SysPassWord
```

A menu is displayed.

Follow the menu to set the Network Manager password and then the User password.

CAUTION: *You must set both the Network Manager and the User password. If the User password is not set, any unauthorized user can logon with User level privilege.*

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Changing the Default Console Port Baud Rate

To attach a terminal with a baud rate other than 9600, follow these steps:

1. At the Network Manager prompt (Enterprise OS #), enter:

   SysconF

   The System Configuration menu is displayed.

2. Select the Console Port option.

   A submenu displays the console port baud rate options.

3. Select the baud rate you want to use.

4. Set the terminal baud rate to match the baud rate configured for the console port.

CAUTION: *Do not reset the bridge/router before changing the terminal baud rate. After the bridge/router resets, the new baud rate is used and you will not be able to access the system software to enter any commands at the default 9600 baud rate.*

5. After you change the terminal baud rate, reset the bridge/router.

   The new console port baud rate does not become effective until you have reset the bridge/router.

Adding User Accounts

You can add user accounts with either Network Manager or User privilege. Some commands are available only to root.

To add a user account, log on as root and use:

```
AddUser [<username>]
```

If you do not specify a username, you will be prompted for one. Specify the privilege and password at the prompts.

Delete an account using:

```
DELeteUser [<username>]
```

To force a user password to expire, use:

```
EXPire [<username>]
```

Any user can change their password by entering:

PassWord

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To manage multiple users and see all user accounts, enter:

```
UserManage
```

Setting the Time and Date

3Com recommends setting the time and date. Use:

```
SET -SYS DATE = <YYYY/MM/DD HH:MM[:ss]>
```

Enter the time in 24-hour-clock format. For example, to set the date and time to January 10, 1996, 2:40 p.m., enter:

```
SET -SYS DATE = 1996/1/10 14:40
```

Setting System Information

You should set the system name to interoperate with other NETBuilder bridge/routers. You can also set the location and contact so that other system administrators can contact you for information.

To set the system name, location, and contact, follow these steps:

1. (Required) Assign a name to the bridge/router using:

   ```
   SETDefault -SYS SysNAMe = "<string>"
   ```

   For example, to set the system name to Engineering.SanJose, enter:

   ```
   SETDefault -SYS SysNAMe = "Engineering.SanJose"
   ```

2. (Optional) Specify the system location using:

   ```
   SETDefault -SYS SysLOCation = "<string>"
   ```

   For example, to set the system location to SecondFloor.Lab, enter:

   ```
   SETDefault -SYS SysLOCation = "SecondFloor.Lab"
   ```

3. (Optional) Identify the contact person managing the bridge/router using:

   ```
   SETDefault -SYS SysCONtact = "<string>"
   ```

   For example, to identify John Smith as the system contact and (408)555-1111 as the phone number at which to reach him, enter:

   ```
   SETDefault -SYS SysCONtact = "John Smith (408) 555-1111"
   ```

   If the system contact is specified, users can obtain this information using the SHow -SYS SysCONtact command.

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Setting Up Security

To allow system administrator-only access to files, use these commands and parameters:

- RemoteManager

  This SYS Service parameter specifies the Internet addresses of devices that can connect to the system through the REMote command. For information on how to use the RemoteManager parameter, see *Reference for Enterprise OS Software.*

- COMmunity

  This SNMP Service parameter modifies the list of communities. For information on how to use the COMmunity parameter, see *Reference for Enterprise OS Software.*

- To implement auto startup, many NETBuilder configuration files are by default accessible to any SNMP-based manager with read and write privileges. To set SNMP access to read-only for all managers, enter:

  ```
  DELete -SNMP COMmunity “anycom”
  ADD -SNMP COMmunity “anycom” RO
  ```

- The Audit Log feature generates a log message on a network management workstation that captures configuration changes and events for monitoring bridge/routers. For more information on this feature, see *Using Enterprise OS Software*.

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6 Basic Configuration of Ports and Paths

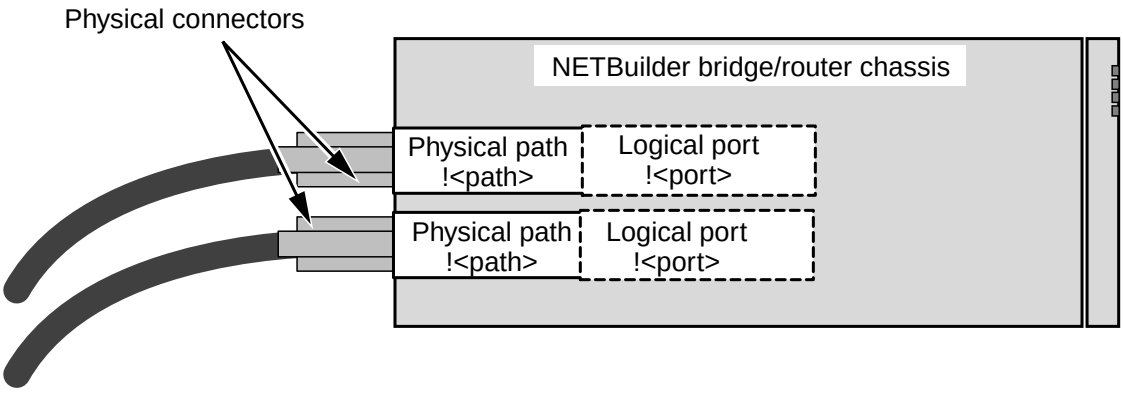
This chapter contains conceptual information about ports and paths and contains basic configuation procedures for each of the interfaces on your SuperStack II NETBuilder SI bridge/router.

Paths, Ports, and Virtual Ports

Ports and paths are the fundamental interface units on the bridge/router, and understanding the concept of ports and paths is important. This section defines ports and paths and explains how they are numbered.

The fundamental difference between paths and ports is that the path is the *physical* interface and the port is the *logical* interface in the software that is mapped to the physical path. Figure 6 illustrates the relationship between paths and ports.

Figure 6 Relationship Between Physical Paths and Logical Ports



Paths and Ports

A *path* is the physical interface that connects a bridge/router to a physical network medium such as Ethernet or a serial line. Each path is associated with a connector. If you have a built-in ISDN connector, each B channel is assigned a separate path, for instance 3.1 and 3.2.

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A *port* is the logical interface used by the software to represent a connection to a network.

By default, each path is assigned to one port. For example, all network traffic received on physical path 1 is treated by the software as arriving on logical port 1, and all traffic that the software transmits through logical port 1 passes through physical path 1.

A path that is assigned to one port is a *static* path. Some configurations require the options described in Table 11.

Table 11 Port and Path Options

Option	Description
Multiple paths per port: dynamic paths	A dynamic path is not assigned to any one port, but is available in a dial pool. A dial pool enables you to dial multiple destinations, use bandwidth-on-demand, and failover to another line without having to reserve specific paths for a port. A port may require multiple paths from the dial pool.
Multiple paths per port: static paths	Use multiple static paths on the same port: ■ To use both B channels together on a built-in ISDN connector using Multilink PPP. ■ To reserve a path for disaster recovery. ■ To use a path for dial-on-demand, failover, or bandwidth-on-demand.
Multiple ports per path: virtual ports	A virtual port can be assigned to a path or to a SysCallerID that represents a remote site.

Dynamic Paths

Ports running PPP can use a dial pool of available paths. A dial pool enables you to dial multiple destinations, use bandwidth-on-demand, and failover to another line without having to reserve specific paths for a port. A dial pool is created when you unbind a path from its port by using:

```
SETDefault !<path> -PATH DialCONTrol = DYNamic
```

See “Configuring Bandwidth Management for PPP” on page 89 for more information about bandwidth management features such as dial-on-demand.

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Multiple Static Paths per Port

If you assign multiple paths to a port, the port must be running PPP.

To use both B channels together on a built-in ISDN connector, to reserve a path for disaster recovery, or to use another path for dial-on-demand, failover, or bandwidth-on-demand, you can assign both paths to one port and use Multilink PPP using:

```
ADD !<port> -PORT PAths <path> [,<path>...]
```

You may want to use static ports instead of a dial pool if you are only dialing one destination and do not need the versatility of a dial pool.

See "Configuring Bandwidth Management for PPP" on page 89 for more information about bandwidth management features such as dial-on-demand.

Virtual Ports

To configure multiple ports over one path, you create *virtual ports*. A virtual port can be assigned to a static path, or for PPP, it can be assigned to the SysCallerID of a remote site. SysCallerID virtual ports use paths in a dial pool and are not associated to any one path.

A virtual port functions the same way as a nonvirtual port does, that is, as a logical interface that represents a connection to a network.

For example, if a SuperStack II bridge/router central node needs to connect to two separate boundary routers over the same ISDN port at different times, you can create a virtual port for each boundary router. The virtual ports would have all the connection information for each boundary router.

Table 12 provides information on topologies that require virtual ports and the node on which the virtual ports should be created.

Table 12 Topologies that Require Virtual Ports

Topology	Virtual Ports Required?	Node That Virtual Ports Should Be Created On
Boundary Routing over Frame Relay or X.25	Yes.	Central node
Traditional routed environment: partially meshed or nonmeshed Frame Relay and X.25 topologies	Depends on bridging or routing protocol. See "Virtual Ports over Frame Relay and X.25" for more information.	Any router
Multidestination dialing (modem pooling) over PPP	Yes, for dynamic dial-up lines.	Central node
Frame Relay topology with disaster recovery configured	Yes.	Nodes on both ends of serial line running Frame Relay

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Virtual Ports over Frame Relay and X.25

Frame Relay and X.25 are peer-to-peer protocols that connect two nodes on the network. Boundary Routing and bridging, Internet Protocol-Open Shortest Path First (IP-OSPF), DECnet IV, VINES, and Xerox Network Systems (XNS) require virtual ports because they do not provide a method for dealing with Frame Relay or X.25 topologies where bridge/routers are not directly connected to all others (full mesh). With Boundary Routing system architecture, when you create a virtual port over a particular path, each remote network attached to the Frame Relay or X.25 cloud is treated as a separate network.

Internet Protocol-Routing Information Protocol (IP-RIP), Internetwork Packet Exchange (IPX), DECnet V, and AppleTalk can operate over partially meshed or nonmeshed Frame Relay or X.25 topologies without the use of virtual ports.

The next-hop split horizon feature in IP-RIP, IPX, and AppleTalk RTMP allows communication between bridge/routers that are not directly connected to one another. To configure next-hop split horizon for these routing protocols, you must have a list of neighbors, which can be dynamically generated or manually configured in IP-RIP. Next-hop split horizon is configured by adding static mappings to the address mapping table.

You can configure dynamic neighbor learning for IPX using the CONTrol parameter in the NRIP, SAP, and NLSP Services.

Although it is not necessary to define virtual ports on IP-RIP, IPX, or AppleTalk routers in partially meshed or nonmeshed Frame Relay or X.25 topologies, virtual ports do provide the following additional benefits:

- A virtual port can be defined for each configured neighbor, which allows you to set up such features as filters and routing policies on a per-neighbor basis.
- Virtual ports provide easier control over your network, turning your network into several point-to-point lines.

If you want your SuperStack II bridge/router to act as an Open System Interconnection (OSI) router in a Frame Relay or X.25 topology, you do not need to create virtual ports.

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Table 13 lists each bridging and routing protocol and the technique you must use to deal with the lack of connectivity in partially meshed and nonmeshed Frame Relay and X.25 topologies.

Table 13 Connectivity in Partially Meshed and Nonmeshed Topologies

Protocol	Technique
Bridging	Virtual port
Boundary Routing	Virtual port
IP-RIP*	Next-hop split horizon
IP-OSPF	Virtual port
IPX*	Next-hop split horizon
APPN*	No special configuration if sending APPN only over Frame Relay
DECnet IV	Virtual port
OSI/DECnet V	No special configuration required
VINES	Virtual port
XNS	Virtual port
AppleTalk*	Next-hop split horizon

* When configuring this protocol and another protocol that requires virtual ports over the same path, use virtual ports.

Virtual Ports over PPP

PPP virtual ports differ from Frame Relay and X.25 virtual ports in the following ways:

- A PPP virtual port can potentially use any path in the dial pool.

  Frame Relay and X.25 virtual ports are always associated with a particular path.

- PPP virtual ports operate independently and do not have a parent port. No parent port exists because the path was unbound from its port and placed into the dynamic dial path pool.

  Frame Relay and X.25 virtual ports inherit the attributes of the path over which they are defined.

- PPP virtual ports can be used with dial-up related parameters.

  Frame Relay and X.25 virtual ports cannot be used with dial-up related parameters.

You can use virtual ports in a PPP environment to provide dial pooling at the central site router. With dial pooling, a set of dynamic paths is

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unbound from their default ports and waits in the dial pool for an incoming call. When a call is received, the dynamic path that answers is assigned to a virtual port, which is standing by with the appropriate configuration information for the calling network. Because not all sites using a dial pool call the central site at the same time, it is possible to share a small group of paths with a larger group of sites. Each site that can potentially call into the dial pool has its own virtual port defined, so there are usually more virtual ports configured for the dial pool than dynamic paths assigned to it.

Parent Ports for Frame Relay and X.25

When you configure an X.25, or Frame Relay virtual port, it inherits the attributes of the path over which it is defined. It also inherits some of the attributes of its parent port.

For PPP dial virtual ports, no parent port exists because the path was unbound from its port and placed into the dynamic dial path pool.

Unlike Frame Relay and X.25 virtual ports, which are always associated with a particular path, PPP virtual ports can potentially use any path in the dynamic dial path pool. PPP virtual ports also can be used with dial-up related parameters.

For example, if you create a Frame Relay or X.25 virtual port associated with a wide area port, the virtual port inherits port attributes from the following sources:

- Default and configured values of PORT Service parameters specified for a wide area port, with the exception PORT Service parameters that are not related to X.25 and Frame Relay virtual ports.
- Default and configured values of parameters from all other services specified for a wide area port.

To configure a virtual port, you must specify the virtual port and not the parent port. For example, if you are using the SETDefault !<port> -BCN CONTrol = Enabled syntax, you must specify the virtual port number instead of the parent port number for <port>. For complete information on the numbering convention of virtual ports, see “Path and Port Numbering” on page 69.

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Path and Port Numbering

The following tables outline the default port and path numbering for the SuperStack II bridge/router.

Although the WAN connector on the model 5xx bridge/router is in a different physical location than the WAN connector on the model 4xx bridge/router, its path numbering is the same.

Table 14 Path and Port Numbering for Model 43x , 44x, 53x, and 54x Bridge/Routers

Path No.	Connector Mapped To	Port No. Mapped To
1	L1	1
2	L2	2
3.1*	WAN	3
3.2	WAN	4
4	Serial A	5
5	Serial B	6
6	Serial C (model 5xx only)	7
7	Serial D (model 5xx only)	8

* For built-in ISDN ports, the path numbering convention differs from the convention on a non-ISDN port. Instead of numbering only the physical interface or connector, such as path 3, ISDN sometimes requires that you number the connector and the multiple channels that transmit data (path 3.*n*).

Table 15 Path and Port Numbering for Model 45x, 46x, 55x, and 56x Bridge/Routers

Path No.	Connector Mapped To	Port No. Mapped To
1	L1	1
2	L2	2
3	WAN	3
4	Serial A	4
5	Serial B	5
6	Serial C (model 5xx only)	6
7	Serial D (model 5xx only)	7

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Configuring Ethernet Paths and Ports

By default, the Ethernet paths and ports are enabled.

The software automatically detects the following settings:

- **Baud** — 10 Mbps or 100 Mbps
- **Duplex** — full or half

See Appendix 9 for information about naming paths.

You should not attempt to take any configuration files from a model 4xx bridge/router and move them to a model 5xx bridge/router.

Configuring ISDN on the WAN Port (43x, 44x, 53x, and 54x)

Model 43x, 44x, 53x and 54x bridge/routers have a built-in ISDN WAN port. If you are attaching terminal adapters (TAs) to the serial ports, see "Configuring Serial Ports with DCEs" on page 75. This section contains the following configuration procedures:

- Configuring ISDN in the U.S. and Canada
- Configuring ISDN in Europe, Australia, and Asia

Configuring ISDN in the U.S. and Canada

Before beginning this procedure, complete the following tasks:

- Cable the ISDN port and connect it to the telephone network.
- Log on to the system with Network Manager privilege.

To configure an ISDN line in the US and Canada, use the SpidWIZard parameter to automatically detect the switch type and SPIDs. The following switch types are supported by the SpidWIZard parameter:

- DMS 100
- AT&T 5ESS (also detects whether a line is point-to-point or multipoint)
- AT&T 5ESS Custom (also detects whether a line is point-to-point or multipoint)
- National ISDN

To configure the ISDN port, follow these steps:

1 Set the local telephone number for each B channel using:

```
SETDefault !3.1 -PATH LocalDialNo = "<string>"
SETDefault !3.2 -PATH LocalDialNo = "<string>"
```

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If you have only one local telephone number, enter the same number for both channels.

2 If you are planning to use channel B2 as a separate line, and your telecommunications carrier provided only one telephone number for all channels, specify a subaddress using:

```
SETDefault !3.2 -PATH LocalSubAddr = "<string>"
```

3 Enable the SpidWIZard parameter and re-enable the path by entering:

```
SETDefault !3 -PATH SpidWIZard = Trigger
SETDefault !3 -PATH CONTrol = Enable
```

The bridge/router automatically detects the switch type and SPIDs of the ISDN line and disables the parameter. If you change your local telephone number, you will have to re-enable the SpidWIZard parameter.

Do not disable the SpidWIZard parameter while it is detecting the switch type and SPIDs. If you do, you will have to restart the bridge/router.

If the SpidWIZard parameter does not detect the switch type and SPIDs correctly, complete the procedure in the next section.

Configuring ISDN in Europe, Australia, and Asia

Before beginning this procedure, complete the following tasks:

- Cable the ISDN port and connect it to the telephone network.
- Log on to the system with Network Manager privilege.

To configure an ISDN port in Europe, Australia, or Asia, or if the SpidWIZard parameter was not successful in the U.S and Canada, follow these steps:

Installations in Hong Kong should be configured to originate and receive ISDN calls at 64 Kbps. Due to the variety of ISDN swtiches in the Hong Kong Telecom network, the SuperStack II NETBuilder SI bridge/router does not properly handle rate-adapted ISDN calls at 56 Kbps.

1 Set the switch type. By default, the switch type is set to European Telecommunications Standards Institute (ETSI). If you need to change the switch type setting, see Table 16 and use:

```
SETDefault !<connectorID> -PATH SwitchType = ETSI | NTT | KDD |
   NI1 | ATT5ESS | DMS100 | VN3 | AUSTEL
```

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Table 16 ISDN Switch Types Supported

SwitchType Setting	Country or Region
NTT	Japan (domestic)
KDD	Japan (international)
ETSI	Europe and Asia Pacific region
NI1 ATT5ESS DMS100	U.S. and Canada
AUSTEL	Australia
VN3	France

2 In the U.S. and Canada, set the SPIDs and directory numbers (DNs) (if assigned by the telephone company) for each channel using:

```
SETDefault !3 -PATH SPIDdn1 “<string>”
```

DNs may be required for some DMS 100 or NI1 switches. When specifying both a SPID and a DN, enter the SPID, then a semicolon (;), then the DN.

If you have a second SPID or DN, use:

```
SETDefault !3 -PATH SPIDdn2 “<string>”
```

3 Set the local telephone number for each B channel using:

```
SETDefault !3.1 -PATH LocalDialNo = “<string>”
SETDefault !3.2 -PATH LocalDialNo = “<string>”
```

If you have only one local telephone number, enter the same number for both channels.

4 If you are planning to use channel B2 as a separate line, and your telecommunications carrier provided only one telephone number for all channels, specify a subaddress using:

```
SETDefault !3.2 -PATH LocalSubAddr = “<string>”
```

5 Enable both channels to make sure all settings take effect by entering:

```
SETDefault !3.1 -PATH CONTrol = Enabled
SETDefault !3.2 -PATH CONTrol = Enabled
```

Placing a Data Over Voice Call

In many areas, voice calls over ISDN are charged at a lower rate than data calls. You can specify that calls to a given number be established as voice calls. This feature is sometimes referred to as a TollSaver capability. Telephone companies often refer to this type of call as Switched 56

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Permissive. The answering device must be capable of generating the 2.1 KHz tone needed to disable any echo cancellers on the line. Consult with the owner of the destination equipment to see whether it has this capability.

To configure this feature, you must define the DialNoList entry with a type of BriV, by using:

```
ADD !<port> -POrt DialNoList "<phone number>" Type=BriV
```

The Baud specifier in the ADD command, although not disallowed, is ignored if present. Data sent over the B channel will only be sent at 56 Kbps.

Example

To place a data over voice call on port 2 to an ISP with the phone number 453-4444, enter:

```
ADD !2 -POrt DialNoList "4534444" Type=BriV
```

Enabling Digi64S2

There are two types of ISDN leased lines in Germany: Digi64S and Digi64S2. Digi64S can run only on the B1 channel, but Digi64S2 can run on the B1 and B2 channels.

To enable the Digi64S2 feature, follow these steps:

1. Set the LineType parameter to Digi64S2 by entering:

   `SETDefault !2.1 -PAth LineType = Digi64S2` (abbreviated d64s2)
   `SETDefault !2.2 -PAth LineType = Digi64S2`

2. Toggle the respective paths by entering:

   ```
   SETDefault !2.1 -PAth cont=e
   SETDefault !2.2 -PAth cont=e
   ```

   Path 2.1 is mapped to the B1 channel and path 2.2 is mapped to the B2 channel. This mapping is not interchangeable.

   If one of the paths is set to Digi64S2, the path in the same connector line is also set to Digi64S2. Mixtures of line types within a single connector are not supported.

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Configuring the 56/64 Kbps CSU/DSU WAN Port (Model 45x and 55x)

This section describes how to set the baud rate for the 56/64 Kbps CSU/DSU port.

Before beginning this procedure, complete the following tasks:

- Cable the 56/64 Kbps CSU/DSU port and connect it to the telephone network.
- Log on to the system with Network Manager privilege.

The default baud rate is 64 Kbps. Change the baud rate if necessary using:

```
SETDefault !3 -PATH Baud = <kbps> (56 or 64)
```

Re-enable the path by entering:

```
SETDefault !3 -PATH CONTrol = Enabled
```

Configuring the T1/FT1 RJ-48 Telco Port (Model 46x and 56x)

This section describes how to configure the T1/FT1 RJ-48 Telco port.

Before beginning this procedure, complete the following tasks:

- Cable the T1/FT1 RJ-48 Telco port and connect it to the telephone network.
- Log on to the system with Network Manager privilege.

To configure the T1/FT1 RJ-48 Telco port, follow these steps:

1. Select the channels that are mapped to the Fractional T1/T1 channel using:

   ```
   ADD !<path> -PATH T1ChannelMap <path number> (1-24)
   ```

   Where <path number> is the DS0 channel you are adding.

2. Set the T1 line distance using:

   ```
   SETDefault !<path> -PATH T1LineDistance = [LH1 | LH2 | LH3 | LH4 |
     SH1 | SH2 | SH3 | SH4 | SH5|]
   ```

   The following table lists the values associated with these options.

LH1 = 0 db	SH1 = 0 - 133 feet
LH3 = 15 db	SH3 = 266 - 399 feet
LH2 = 7.5 db	SH2 = 133 - 266 feet

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LH4 = 22.5 db	SH4 = 399 - 533 feet SH5 = 533 - 655 feet

3 Set the baud rate (56 or 64 kbps) for the DS0 channel using:

```
SETDefault !<path> -PATH T1DSoChnlBaud = <FT156K|FT164K>
```

4 Set the path clock using:

```
SETDefault !<path> clock = [Internal | External]
```

5 Re-enable the path using:

```
SETDefault !<path> -PATH CONTrol = Enabled
```

The following optional settings are also available:

- T1FrameMode
  - Superfame (SF)
  - Extended Superframe (ESF)
- T1LineCoding
  - Binary with 8 zero substitution (B8ZS)
  - Alternate Mark Inversion (AMI)
  - Alternate Mark Inversion with bit 7 zero code substitution (AMIB7ZCS)

Configuring Serial Ports with DCEs

This section describes how to configure the serial ports with modems, CSU/DSUs, or ISDN TAs attached.

Before beginning this procedure, complete the following tasks:

- Cable the serial port and connect it to the telephone network.
- Log on to the system with Network Manager privilege.

The serial port automatically detects the following settings:

- **Line type** — dial-up or leased
- **Clock** — external
- **Connector type** — RS-232, V.35, X.21, RS-449, or RS-530

ISDN TAs

If you are attaching an ISDN TA, you must configure the TA with the SPIDs, switch type, local telephone numbers, and Multilink PPP options

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before you connect it to the SuperStack II bridge/router. See the documentation that came with your TA for more information.

To configure the serial port with a DCE, follow these steps:

1 The default baud rate for the serial port is 64 Kbps. If you need to change the baud rate, use:

```
SETDefault !<path> -PATH Baud = <kbps> (1.2-2048)
```

2 The default device type is Modem. Specify the external device type attached to the Flex-WAN cable using:

```
SETDefault !<path> -PATH ExDevType = [Modem | Bri | Sw56]
```

3 If you have changed any of the default settings, re-enable the path to make sure all settings on the path take effect using:

```
SETDefault !<path> -PATH CONTrol = Enabled
```

Configuring Serial Ports with DTEs

This section describes how to configure the serial ports when connecting directly to IBM legacy equipment.

Before beginning this procedure, complete the following tasks:

- Attach the Flex-WAN cable to the serial port and the DTE.
- Log on to the system with Network Manager privilege.

The Flex-WAN serial port automatically detects the following settings:

- **Line type** — leased
- **Clock** — internal
- **Connector type** — RS-232, V.35, X.21, or RS-449

To configure the serial port with a DTE, follow these steps:

1 The default baud rate for the serial port is 64 Kbps. If you need to change the baud rate, use:

```
SETDefault !<path> -PATH Baud = <kbps> (1.2-2048)
```

2 Set the owner of the serial port using:

```
SETDefault !<port> -PORT OWNer = BSC | ATUN | SHDLC | SDLC
```

See *Using Enterprise OS Software* for more information about IBM legacy protocols.

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Where to Go From Here

If you have a leased line, see Chapter 8 to configure bridging, IP, and IPX routing.

For dial-up, Frame Relay, or X.25 lines, see Chapter 7 to complete your port and path configuration.

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7 ADVANCED CONFIGURATION OF PORTS AND PATHS

This chapter provides scenarios for configuring the WAN and Serial ports for dial-up with PPP, Frame Relay, or X.25.

After completing basic configuration on the ports and paths as described in Chapter 6, complete the scenarios in this chapter appropriate to your network.

You should not attempt to take any configuration files from a model 4xx bridge/router and move them to a model 5xx bridge/router.

Configuring Dial-Up Lines with PPP

This section includes dial-up scenarios for the built-in ISDN port on the model 43x, 44x, 53x and 54x bridge/routers and for the serial ports on all models.

Bandwidth management features that can be enabled after configuring the ports and paths are described in Table 17.

Table 17 Bandwidth Management Features for Dial-Up Lines

Bandwidth Management Feature	Description	Location
Dial-on-demand or manual dial	To dial out on the ISDN and serial lines, you can configure dial-on-demand or manual dial. Dial-on-demand automatically dials the destination bridge/router when network traffic is present and hangs up when the network is idle. Dial-on-demand also provides *failover* support. If the primary line goes down, the bridge/router will failover to another available dial-up line, either from a dial pool or from another path assigned to the same port. To dial manually, use NETBuilder commands to dial and hangup.	Dial-on-demand: see page 90 Manual dial: see page 90

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Table 17 Bandwidth Management Features for Dial-Up Lines (continued)

Bandwidth Management Feature	Description	Location
Dial number list	A dial number list allows the software to select a phone number from a list of destination phone numbers associated with a port or virtual port. Numbers in the dial list are selected sequentially. The dial number list is required.	Procedure included in scenarios More information: See Chapter 9
Bandwidth-on-demand	When the system detects traffic congestion on a port, you can enable bandwidth-on-demand to automatically bring up more lines either from a dial pool or from another path assigned to the same port. You specify the bandwidth that a port should operate at normally, then define the maximum amount of bandwidth above this setting that the port can have.	See page 91
Disaster recovery	If the primary line fails, the bridge/router can use a reserved dial-up line as back-up.	See page 92

ISDN on the WAN Port (43x, 44x, 53x and 54x)

This section describes three scenarios using the built-in ISDN port:

- Scenario 1: Using Each B Channel Separately
- Scenario 2: Using Both B Channels Together
- Scenario 3: Connecting to Multiple Destinations

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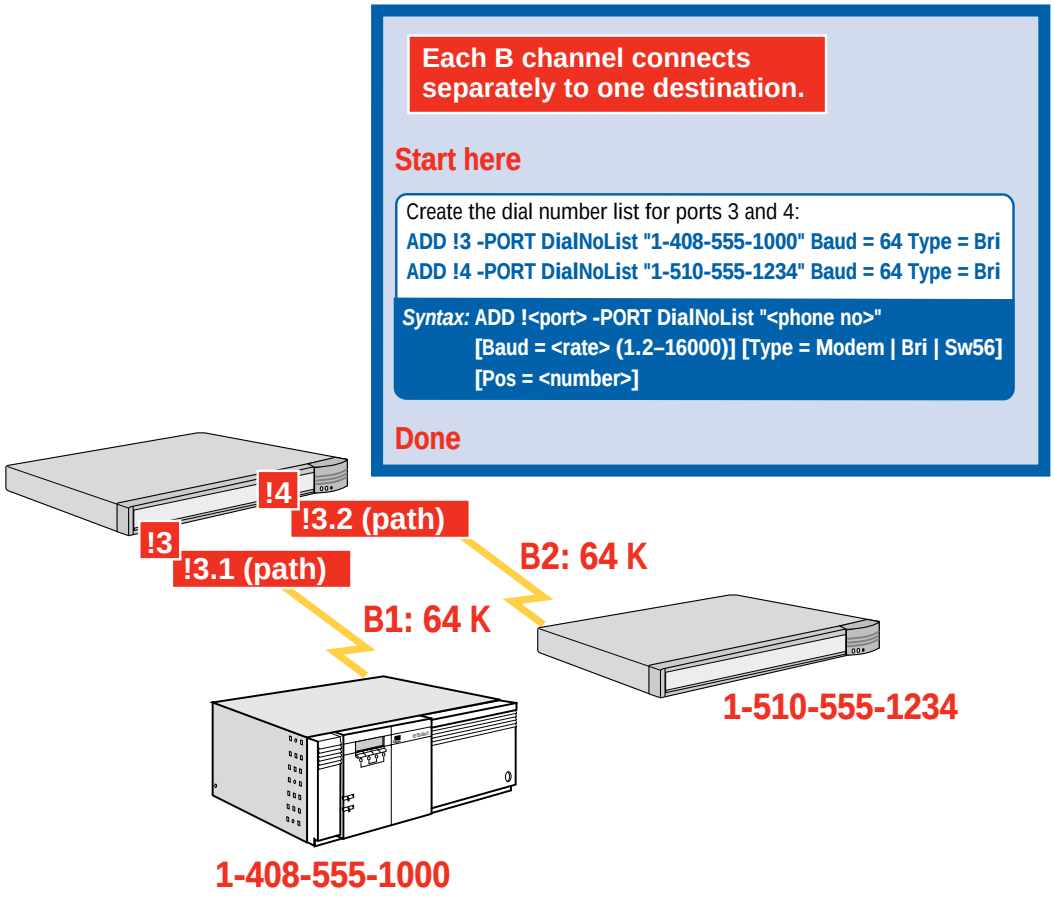
Scenario 1: Using Each B Channel Separately

If you need to connect to two separate locations at 64 Kbps, use each B channel separately. Each B channel can connect to only one location, though both locations can be separate ports on the same bridge/router.


Each B channel connects separately to one destination.
Start here
Create the dial number list for ports 3 and 4:
ADD !3 -PORT DialNoList "1-408-555-1000" Baud = 64 Type = Bri
ADD !4 -PORT DialNoList "1-510-555-1234" Baud = 64 Type = Bri
Syntax: ADD !<port> -PORT DialNoList "<phone no>"
[Baud = <rate> (1.2–16000)] [Type = Modem | Bri | Sw56]
[Pos = <number>]
Done
!4
!3.2 (path)
!3
!3.1 (path)
B2: 64 K
B1: 64 K
1-510-555-1234
1-408-555-1000

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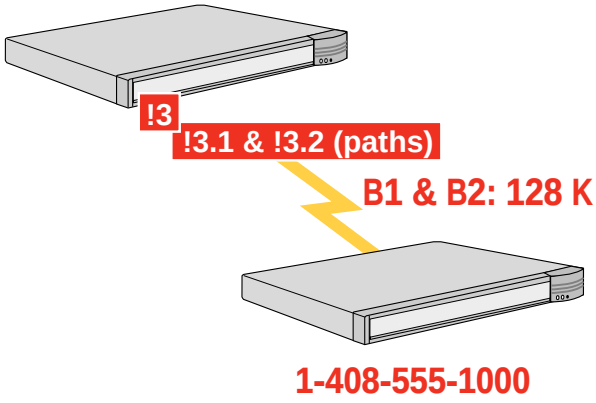
Scenario 2: Using Both B Channels Together

If you need to connect to one location at 128 Kbps, use both B channels together.

The destination must be running Multilink PPP, either on the NETBuilder bridge/router with a built-in ISDN port or on the TA.



Both B channels connect to one destination.

Start here

Add path 3.2 to port 3:
ADD !3 -PORT PAths 3.2

Syntax: **ADD !<port> -PORT PAths <connectorID.channelID> [,...]**

Set the normal bandwidth for port 3:
SETDefault !3 -PORT NORMalBandwidth = 128

Syntax: **SETDefault !<port> -PORT NORMalBandwidth = <kbps> (>=0)**

Enable Multilink PPP on port 3:
SETDefault !3 -PPP MlpCONTrol = Enabled, NoFragment

Syntax: **SETDefault !<port> -PPP MlpCONTrol = ([Enabled | Disabled], [Fragment | NoFragment])**

Create the dial number list for port 3. If you have one phone number for your destination, enter the number twice with a letter after the second entry. If you have two numbers, enter each phone number:
ADD !3 -PORT DialNoList "1-408-555-1000" Baud = 64 Type = Bri
ADD !3 -PORT DialNoList "1-408-555-1000a" Baud = 64 Type = Bri

Syntax: **ADD !<port> -PORT DialNoList "<phone no>" [Baud = <rate> (1.2–16000)] [Type = Modem | Bri | Sw56] [Pos = <number>]**

Done

Scenario 3: Connecting to Multiple Destinations

If you need to connect to multiple destinations using one or both B channels, use a dial pool that contains all ISDN paths. The following scenarios show how a SuperStack II bridge/router using a dial pool can connect to three different locations.

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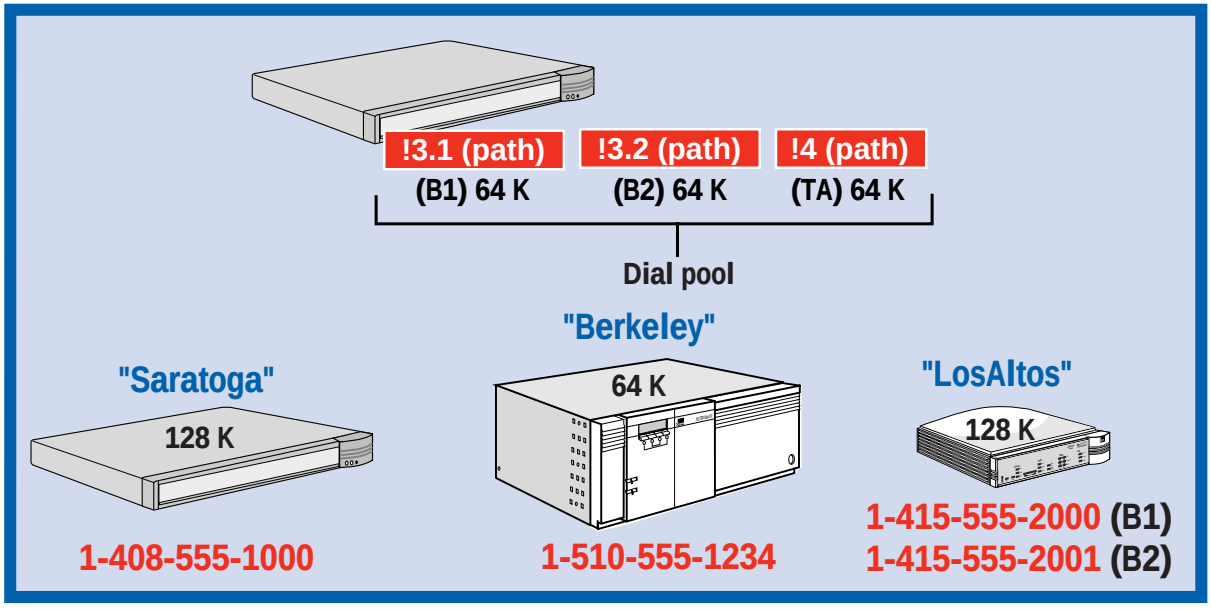
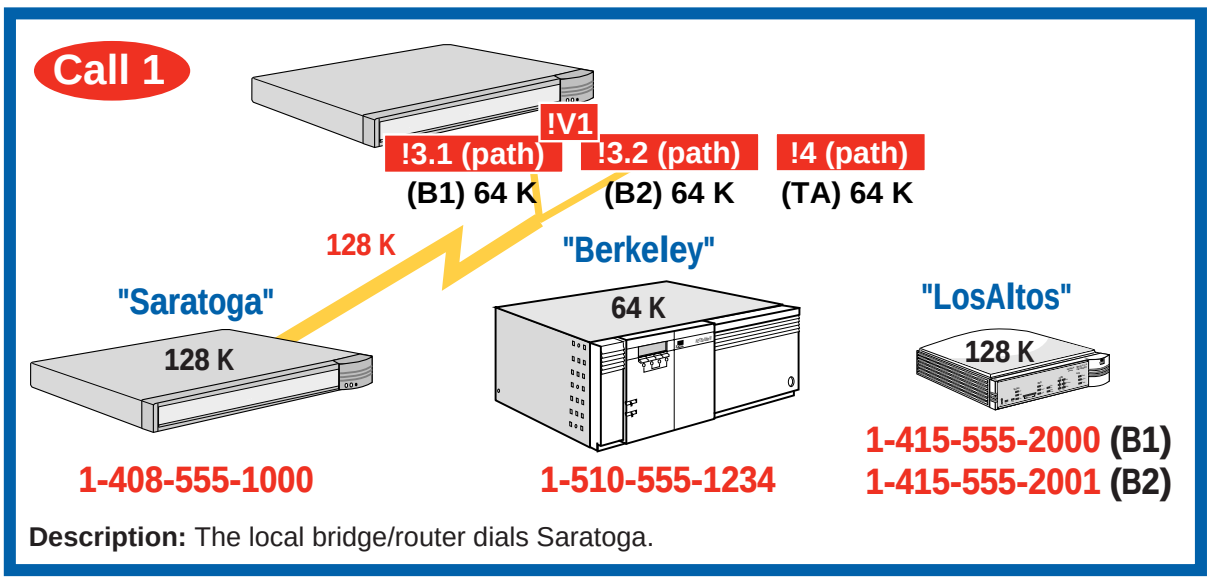
The following prerequisites apply to your network:

- To use both B channels together, the destination must be running Multilink PPP, either on the NETBuilder bridge/router with a built-in ISDN port or on the TA.
- If you use built-in ISDN ports and ISDN TAs in the same dial pool, and you are using Multilink PPP on the SuperStack II bridge/router, you can use the TA at only 56 or 64 Kbps.
- When using a dial pool, you cannot accept phone calls from other vendors' bridge/routers.





Description: The local bridge/router dials Saratoga.

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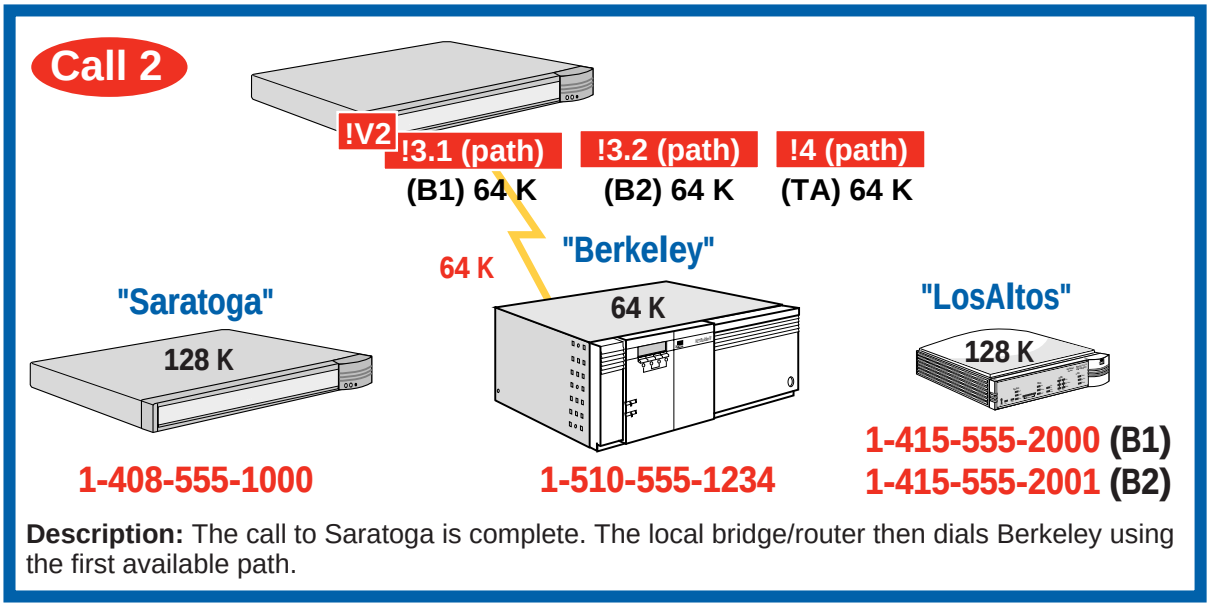
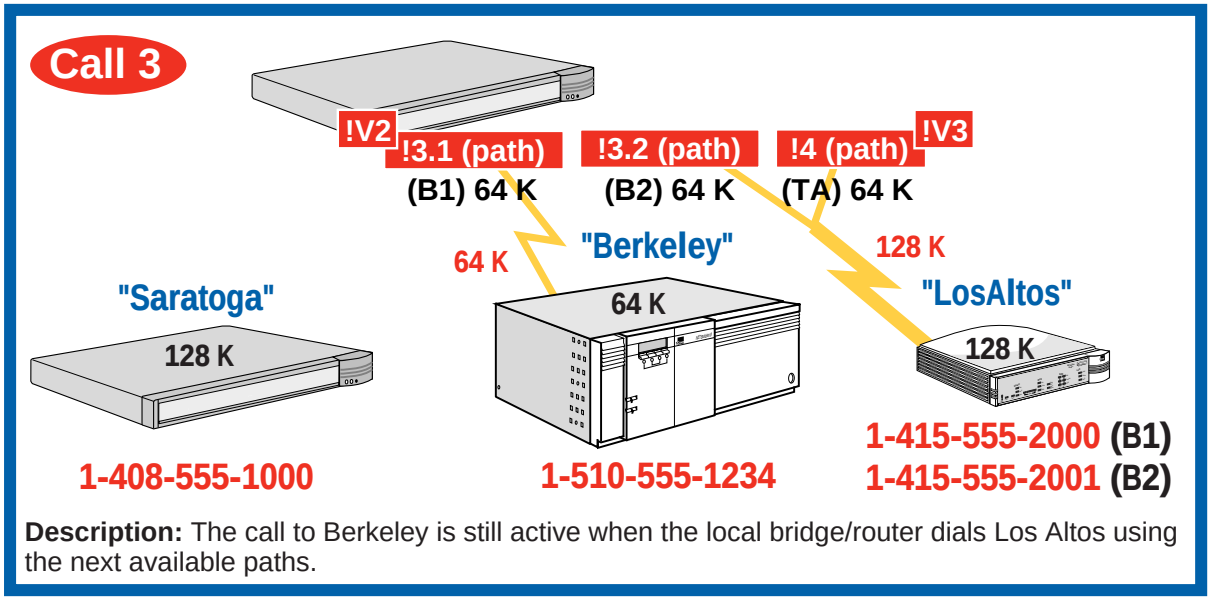


Description: The call to Saratoga is complete. The local bridge/router then dials Berkeley using the first available path.



Description: The call to Berkeley is still active when the local bridge/router dials Los Altos using the next available paths.

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Multiple destinations connect with a dial pool.

Start here

Unbind each ISDN path from its port:

```
SETDefault !3.1 -PATH DialCONTrol = DYNamic
SETDefault !3.2 -PATH DialCONTrol = DYNamic
SETDefault !4 -PATH DialCONTrol = DYNamic
```

Syntax: `SETDefault !<path> -PATH DialCONTrol = DYNamic | STAtic`

Create a virtual port for each destination using their SysCallerIDs:

```
ADD !V1 -PORT VirtualPort SCID "Saratoga"
ADD !V2 -PORT VirtualPort SCID "Berkeley"
ADD !V3 -PORT VirtualPort SCID "LosAltos"
```

Syntax: `ADD !<port> -PORT VirtualPort SCID "<SysCallerID>"`

Set the normal bandwidth for each virtual port that differs from the default 64 Kbps:

```
SETDefault !V1 -PORT NORMalBandwidth = 128
SETDefault !V3 -PORT NORMalBandwidth = 128
```

Syntax: `SETDefault !<port> -PORT NORMalBandwidth = <kbps> (>=0)`

Enable Multilink PPP on ports !V1 and !V3 to achieve 128 Kbps:

```
SETDefault !V1 -PPP MlpCONTrol = Enabled
SETDefault !V3 -PPP MlpCONTrol = Enabled
```

Syntax: `SETDefault !<port> -PPP MlpCONTrol = Enabled | Disabled`

Create the dial number list for each virtual port. **For 128 Kbps connections**: if you have one phone number for your destination, enter the number twice with a letter after the second entry. If you have two numbers, enter each phone number:

```
ADD !V1 -PORT DialNoList "1-408-555-1000" Baud = 64 Type = Bri
ADD !V1 -PORT DialNoList "1-408-555-1000a" Baud = 64 Type = Bri
ADD !V2 -PORT DialNoList "1-510-555-1234" Baud = 64 Type = Bri
ADD !V3 -PORT DialNoList "1-415-555-2000" Baud = 64 Type = Bri
ADD !V3 -PORT DialNoList "1-415-555-2001" Baud = 64 Type = Bri
```

Note: The baud rate set in the dial number list matches the baud rate of the lines available to the port. The normal bandwidth determines how many lines of size 64 Kbps to use.

Syntax: `ADD !<port> -PORT DialNoList "<phone no>" [Baud = <rate> (1.2–16000)] [Type = Modem | Bri | Sw56] [Pos = <number>]`

Done

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Configuring Dial-Up over PPP with Modems or TAs

This section describes two dial-up scenarios:

- Scenario 1: Single Destination per Port
- Scenario 2: Multiple Destinations

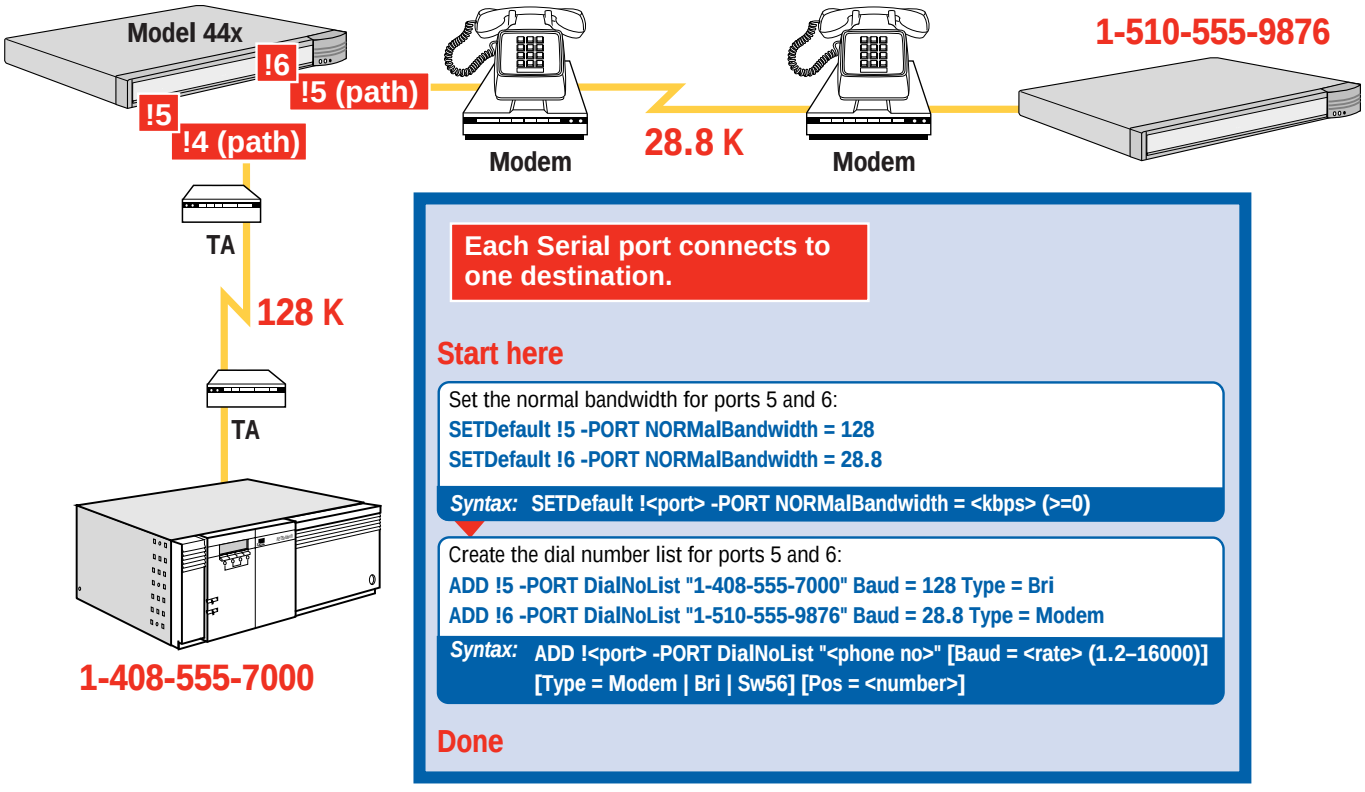
ISDN TAs

If you are using both B channels together for a 128 Kbps connection, each TA used at each end of the connection must support the same B channel aggregation protocol: Multilink PPP or bonding.

You cannot use each B channel independently on an external ISDN TA.

Scenario 1: Single Destination per Port

This scenario shows a model 44x bridge/router connecting to one destination on each serial port.


Model 44x
!6
!5 (path)
!5
!4 (path)
Modem
28.8 K
Modem
1-510-555-9876
TA
128 K
TA
1-408-555-7000
Each Serial port connects to one destination.
Start here
Set the normal bandwidth for ports 5 and 6:
SETDefault !5 -PORT NORMalBandwidth = 128
SETDefault !6 -PORT NORMalBandwidth = 28.8
Syntax: SETDefault !<port> -PORT NORMalBandwidth = <kbps> (>=0)
Create the dial number list for ports 5 and 6:
ADD !5 -PORT DialNoList "1-408-555-7000" Baud = 128 Type = Bri
ADD !6 -PORT DialNoList "1-510-555-9876" Baud = 28.8 Type = Modem
Syntax: ADD !<port> -PORT DialNoList "<phone no>" [Baud = <rate> (1.2–16000)] [Type = Modem | Bri | Sw56] [Pos = <number>]
Done

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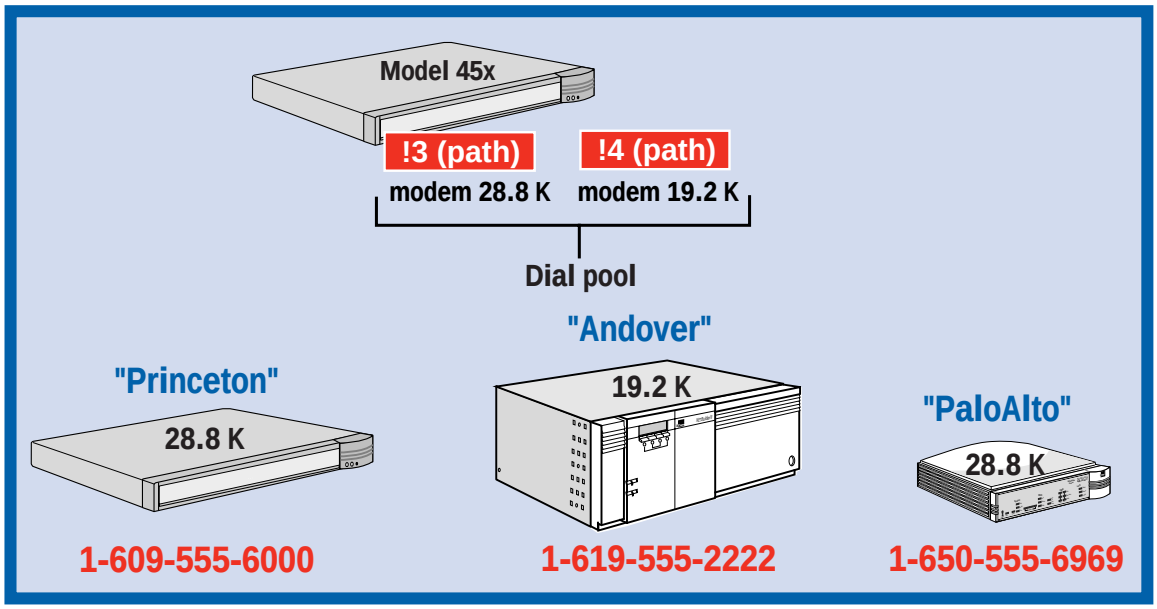
Scenario 2: Multiple Destinations

If you need to connect to multiple destinations, use a dial pool that contains one or both serial paths. The following scenarios show how a model 45x bridge/router using a dial pool can connect to three different bridge/routers. You cannot accept phone calls from other vendors' bridge/routers when using a dial pool.

See "Configuring Dial-Up Lines with PPP" on page 79 for information about using the built-in ISDN port and a TA in a dial pool.

The dial pool does not have to contain both serial paths. You can use one path in the dial pool to connect to multiple destinations, one at a time.



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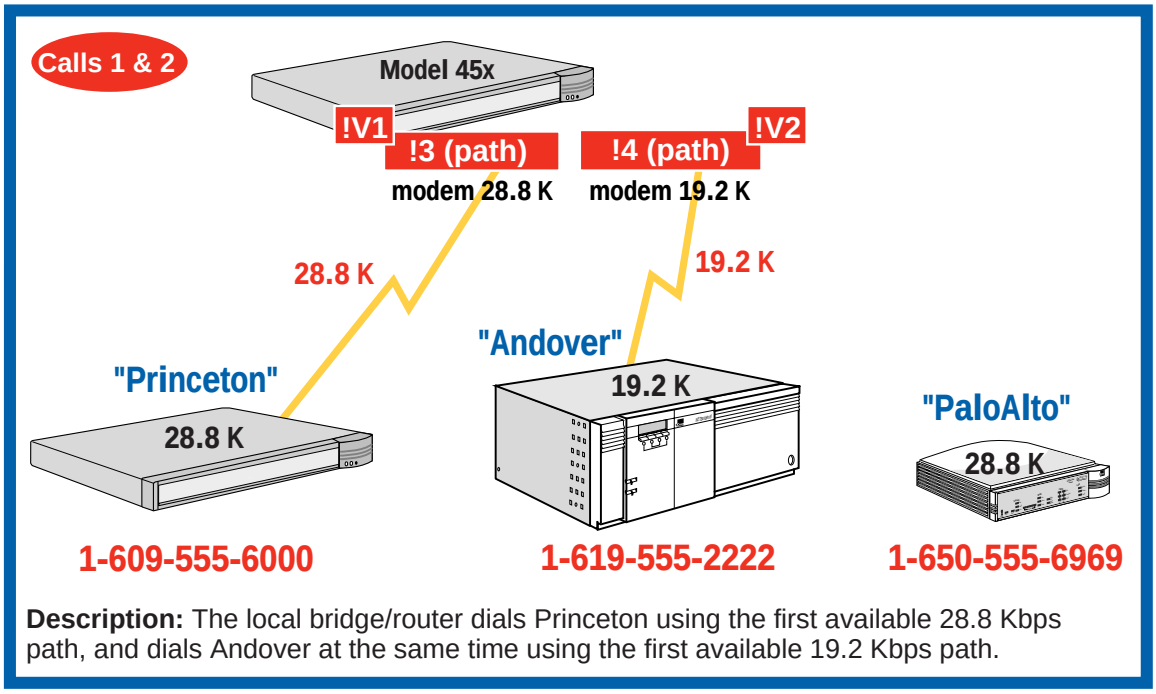
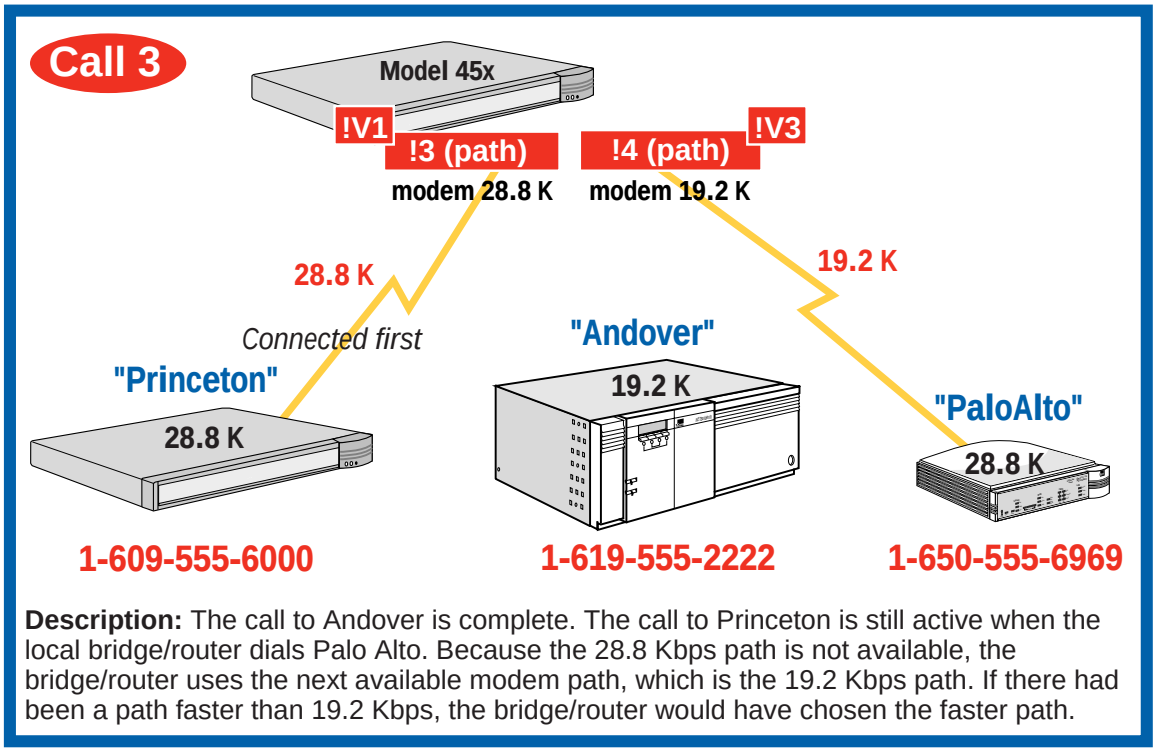


Description: The local bridge/router dials Princeton using the first available 28.8 Kbps path, and dials Andover at the same time using the first available 19.2 Kbps path.



Description: The call to Andover is complete. The call to Princeton is still active when the local bridge/router dials Palo Alto. Because the 28.8 Kbps path is not available, the bridge/router uses the next available modem path, which is the 19.2 Kbps path. If there had been a path faster than 19.2 Kbps, the bridge/router would have chosen the faster path.

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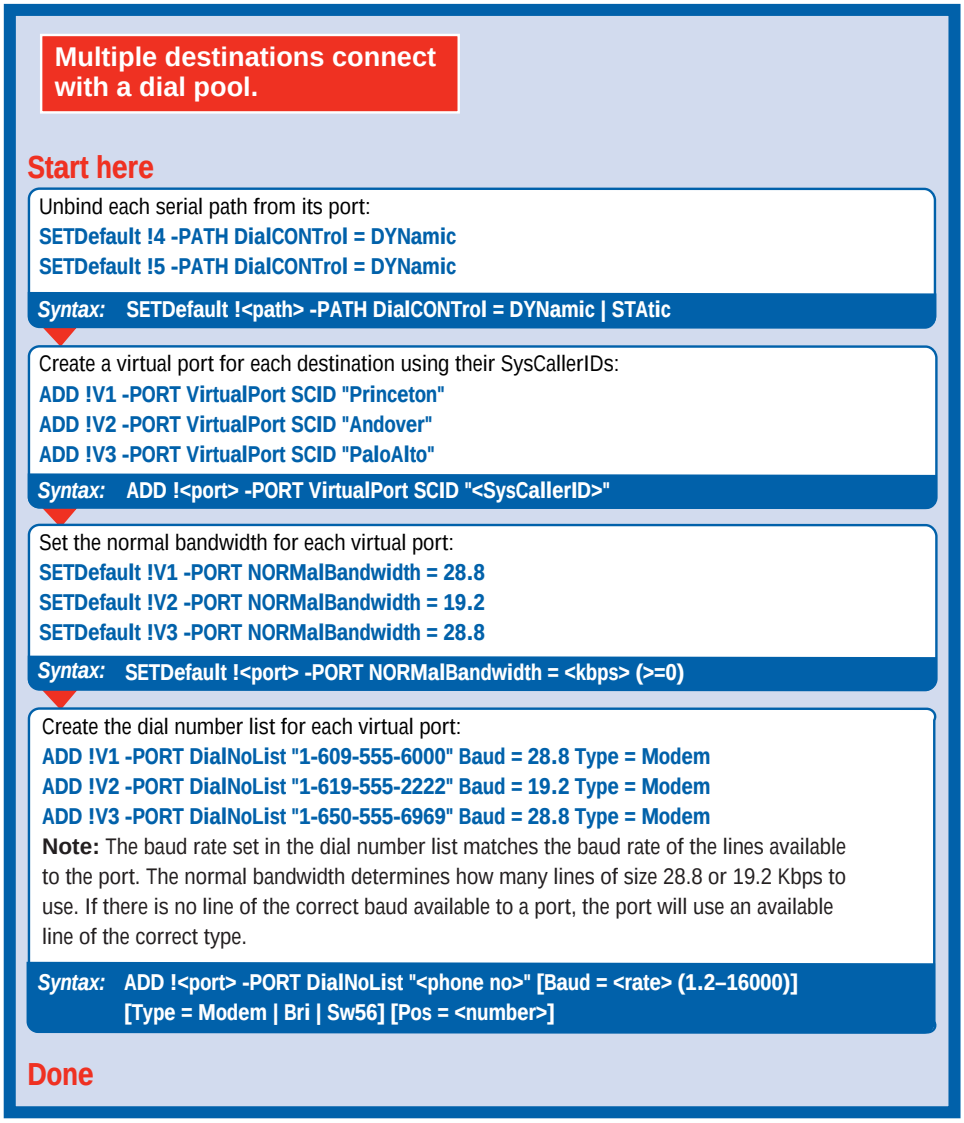
Multiple destinations connect with a dial pool.
Start here
Unbind each serial path from its port:
SETDefault !4 -PATH DialCONTrol = DYNamic
SETDefault !5 -PATH DialCONTrol = DYNamic
Syntax: SETDefault !<path> -PATH DialCONTrol = DYNamic | STAtic
Create a virtual port for each destination using their SysCallerIDs:
ADD !V1 -PORT VirtualPort SCID "Princeton"
ADD !V2 -PORT VirtualPort SCID "Andover"
ADD !V3 -PORT VirtualPort SCID "PaloAlto"
Syntax: ADD !<port> -PORT VirtualPort SCID "<SysCallerID>"
Set the normal bandwidth for each virtual port:
SETDefault !V1 -PORT NORMalBandwidth = 28.8
SETDefault !V2 -PORT NORMalBandwidth = 19.2
SETDefault !V3 -PORT NORMalBandwidth = 28.8
Syntax: SETDefault !<port> -PORT NORMalBandwidth = <kbps> (>=0)
Create the dial number list for each virtual port:
ADD !V1 -PORT DialNoList "1-609-555-6000" Baud = 28.8 Type = Modem
ADD !V2 -PORT DialNoList "1-619-555-2222" Baud = 19.2 Type = Modem
ADD !V3 -PORT DialNoList "1-650-555-6969" Baud = 28.8 Type = Modem
Note: The baud rate set in the dial number list matches the baud rate of the lines available to the port. The normal bandwidth determines how many lines of size 28.8 or 19.2 Kbps to use. If there is no line of the correct baud available to a port, the port will use an available line of the correct type.
Syntax: ADD !<port> -PORT DialNoList "<phone no>" [Baud = <rate> (1.2–16000)] [Type = Modem | Bri | Sw56] [Pos = <number>]
Done

Configuring Bandwidth Management for PPP

This section describes how to configure bandwidth management features for dial-up lines.

Setting Normal Bandwidth

The -PORT NORMalBandwidth parameter specifies the amount of bandwidth the port uses. The default normal bandwidth is usually 64 Kbps. Show the normal bandwidth for a port using:

```
SHow !<port> -PORT NORMalBandwidth
```

Set the normal bandwidth if required using:

```
SETDefault !<port> -PORT NORMalBandwidth = <kbps> (≥0)
```

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Enabling Dial-On-Demand

Dial-on-demand automatically dials the destination bridge/router when network traffic is present and hangs up when the network is idle. Dial-on-demand also provides failover support. If the primary line goes down, the bridge/router will failover to another available dial-up line, either from a dial pool or from another path assigned to the same port. The bridge/router may use multiple lines to acheive the normal bandwidth.

To use failover or to use multiple lines to acheive normal bandwidth, you must have multiple phone numbers in the dial number list. The first number is for the primary line. If the primary line fails or provides less than normal bandwidth, the port dials the second number in the list, then the following numbers in succession if required. The dial number list allows you to use a different path for each phone number by specifying the baud rate and device type.

For example, the first number in my dial number list uses a 64 Kbps BRI line. The second number uses a 28.8 modem. If the ISDN line fails, the port will dial the 28.8 modem next.

See "Working with Dial Number Lists" on page 113 for more information about dial number lists.

To enable dial-on-demand, follow these steps:

1 Enable dial-on-demand for a port or virtual port using:

```
SETDefault !<port> -PORT DialInitState = DialOnDemand
```

2 Set the amount of time before the dial-up line is disconnected if it is not in use:

```
SETDefault !<port> -PORT DialIdleTime = <seconds> (0-3600)
```

Using Manual Dial

Manual dial is enabled by default. To place a call manually, follow these steps:

1 If you have previously enabled dial-on-demand, enable manual dial using:

```
SETDefault !<port> -PORT DialInitState = ManualDial
```

2 Place the call using:

```
DIal !<port> [-PORT] ["<dial-string>"]
```

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If you do not enter a telephone number for dial-string, the software uses the first number in the dial number list.

The dial string must be a number in the dial number list.

3 Hang up the call using:

```
HangUp !<port> [-PORT]
```

Configuring Bandwidth-On-Demand

When the system detects traffic congestion on a port, you can enable bandwidth-on-demand to automatically activate more lines from a dial pool or from another path assigned to the same port.

You specify the bandwidth that a port should operate at normally, then define the maximum amount of bandwidth above this setting that the port can have.

Bandwidth-on-demand only works with dial-on-demand. To use bandwidth-on-demand, you must have multiple phone numbers in the dial number list. The first number is for the primary line. If you need more bandwidth, the port dials the second number in the list, then the following numbers in succession if required.

See “Working with Dial Number Lists” on page 113 for more information about dial number lists.

To configure bandwidth-on-demand, follow these steps:

1 Enable bandwidth-on-demand and specify the amount of additional bandwidth to allocate for a port using:

```
SETDefault !<port> -PORT BODIncrLimit = <kbps>
```

The bridge/router allocates additional bandwidth in increments equal to the Kbps you specify. Maximum total bandwidth equals the BODIncrLimit plus the normal bandwidth.

2 Specify the conditions that activate bandwidth-on-demand using:

```
SETDefault !<port> -PORT BODTHreshold = <%>(0–100)
```

The increase or decrease in bandwidth is based on a percentage of the outgoing traffic rate. Bandwidth is increased when the outgoing traffic rate exceeds the percentage of the current port bandwidth. Bandwidth is decreased when the rate of traffic runs below the specified percentage.

For example, normal available bandwidth is 64 Kbps and you set BODTHreshold to 50%. To activate another line, traffic would have to

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increase to 32 Kbps (50% of 64 Kbps). After the additional 64 Kbps line is up, total bandwidth available is 128 Kbps. To activate the next line, traffic would have to increase to 64 Kbps (50% of 128 Kbps). The same process happens in reverse to deactivate the additional lines.

3 Specify the amount of time bandwidth management should wait to take action to activate or deactivate a port using:

```
SETDefault !<port> -PORT DialSamplPeriod = <seconds>(0–300),
   (0–300)
```

Example To configure a line with a normal bandwidth of 28.8 kbps, enter:

```
SETDefault !4 -PORT BODIncrLimit = 28.8
SETDefault !4 -PORT BODTHreshold = 50
SETDefault !4 -PORT DialSamplPeriod = 30, 60
```

Traffic must exceed 14.4 kbps for 30 seconds before an additional dial path is activated. The additional dial path is deactivated when the rate of traffic is less than 28.8 kbps for longer than 60 seconds.

Configuring Disaster Recovery

If the primary PPP line fails, the bridge/router can use a reserved dial-up line as back-up. See Chapter 8 to fine-tune the disaster recovery line for your routing protocol.

To enable disaster recovery, follow these steps:

1 Enable dial-on-demand.

2 Add the back-up path to the same port as the primary line using:

```
ADD !<port> -PORT PAths <port> [,<port>...]
```

3 Enable disaster recovery using:

```
SETDefault !<port> -PORT DialCONTrol = DisasterRcvry
```

4 Configure the back-up line for disaster recovery only using:

```
SETDefault !<path> -PATH DialCONTrol = DisasterRcvry
```

5 Configure the dial number list for the back-up line using:

```
ADD !<port> -PORT DialNoList “<phone no>” [Baud = <rate>
   (1.2–16000)] [Type = Modem | Bri | Sw56] | [Pos = <number>]
```

See “Working with Dial Number Lists” on page 113 for more information about dial number lists.

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Configuring Frame Relay

This section describes three Frame Relay scenarios:

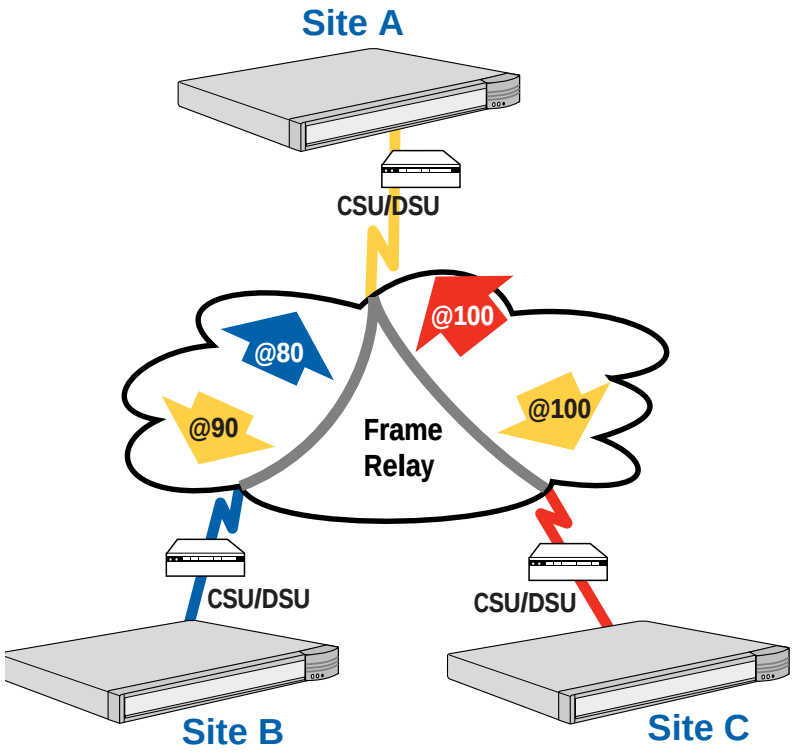
- Scenario 1: Multiple Destinations, Nonmeshed
- Scenario 2: Partially Meshed Topology
- Scenario 3: Fully Meshed Topology

To configure a second Frame Relay line for disaster recovery, see *Using Enterprise OS Software*.

These scenarios require your Frame Relay switch to support the Local Management Interface (LMI) Protocol. If your switch does not support LMI, see *Using Enterprise OS Software* for configuration procedures.

Obtain DLCIs for each remote site from the Frame Relay service provider. A DLCI identifies a circuit from the bridge/router to a destination. The destination uses a different DLCI for the circuit to the main site. Because a DLCI is known only by one end of the link, DLCIs may not be unique.

In the following example, the DLCI from site A to site C is @100. Coincidentally, the DLCI from site C to site A is also @100. Although the numbers are the same, there is no relationship between them. The DLCI from site A to site B is @90, but the DLCI from site B to site A is @80.



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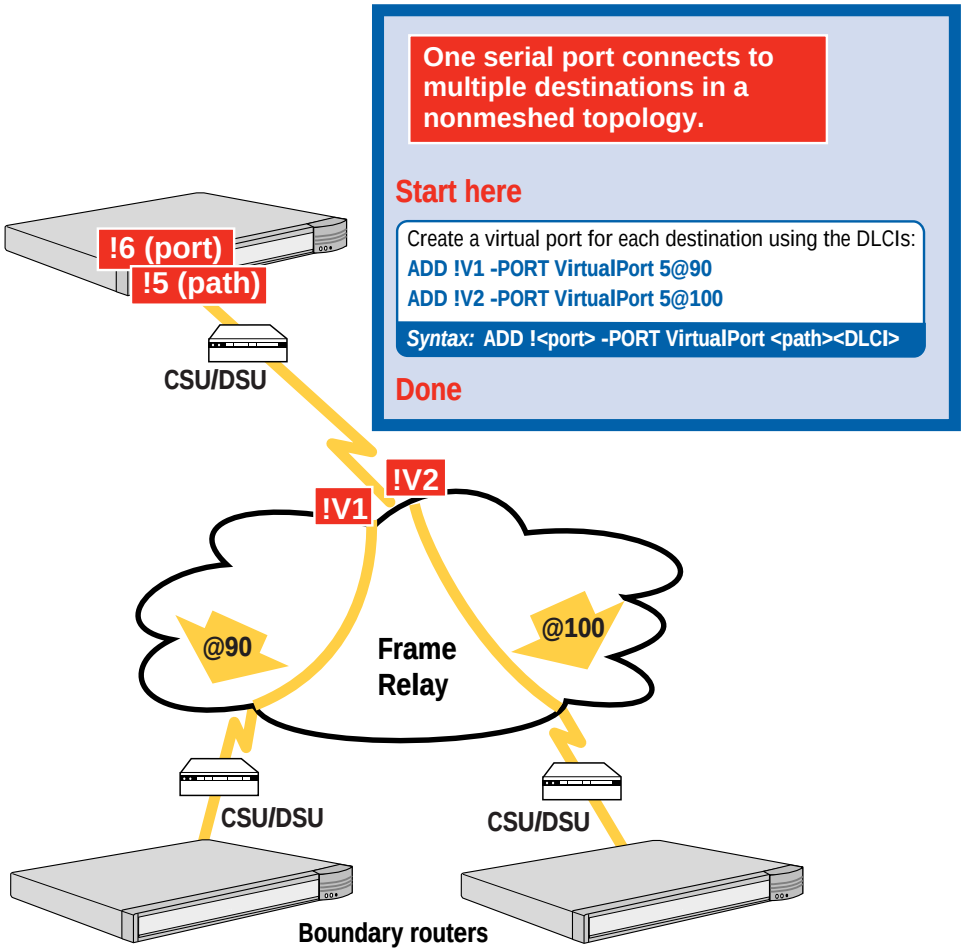
Scenario 1: Multiple Destinations, Nonmeshed

A nonmeshed topology consists of bridge/routers that are not connected directly to every other bridge/router, like in a Boundary Routing topology. To achieve connectivity between all bridge/routers, create virtual ports for each remote site on the central site so traffic can pass from one remote site to another over the same parent port.



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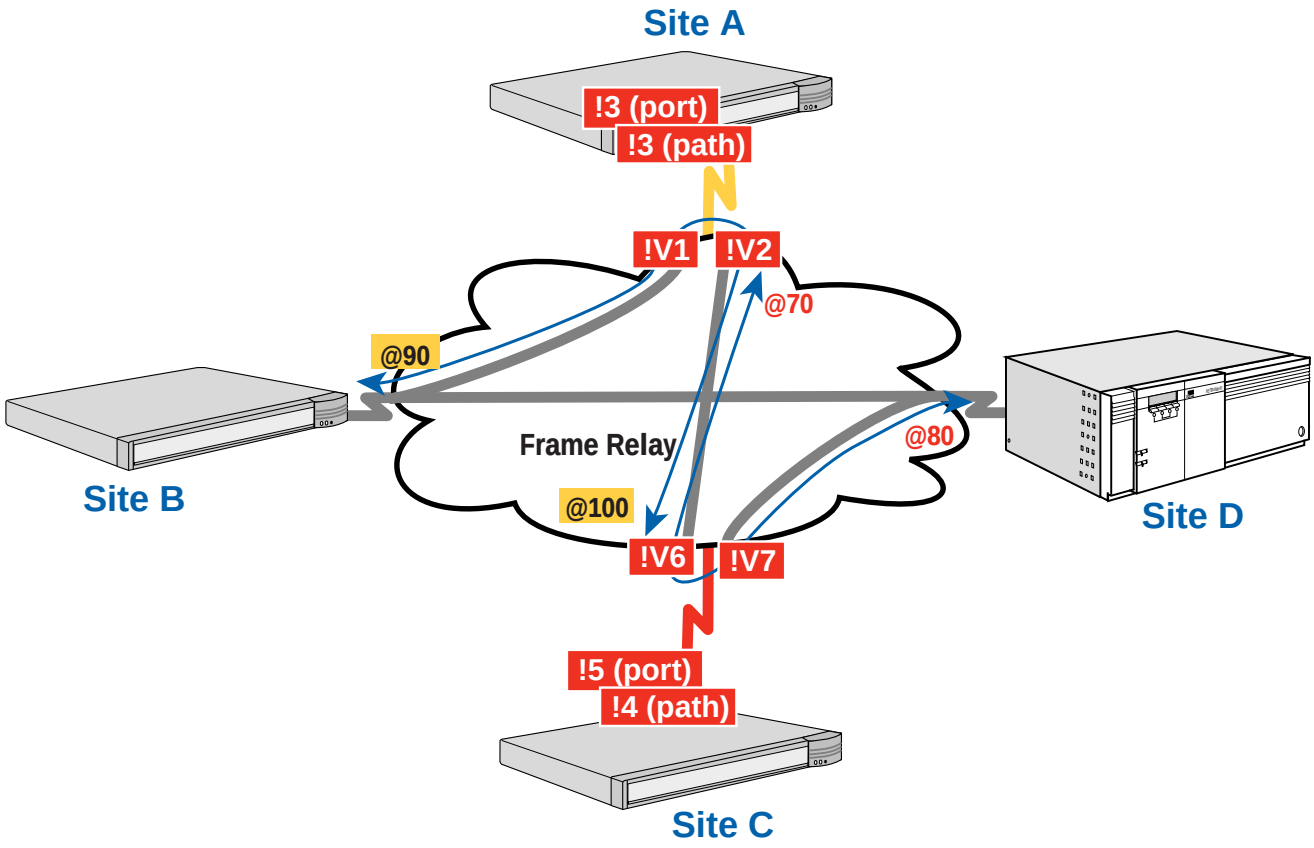
Scenario 2: Partially Meshed Topology

A partially meshed topology consists of bridge/routers that are connected directly to some destinations but not others. Use virtual ports to pass traffic from one site to another over the same parent port.

Instead of using virtual ports (if you run out of virtual ports, for example), you can use the next-hop split horizon feature in the routing protocol. See Using Enterprise OS Software for more information.

In this scenario, site B is not connected to site C, and site A is not connected to site D. Create virtual ports on site A so traffic from site B can pass through site A to get to site C. Create virtual ports on site C so traffic from site D can pass through site C to get to site A. For redundancy, you can create virtual ports on site B and site D as well.



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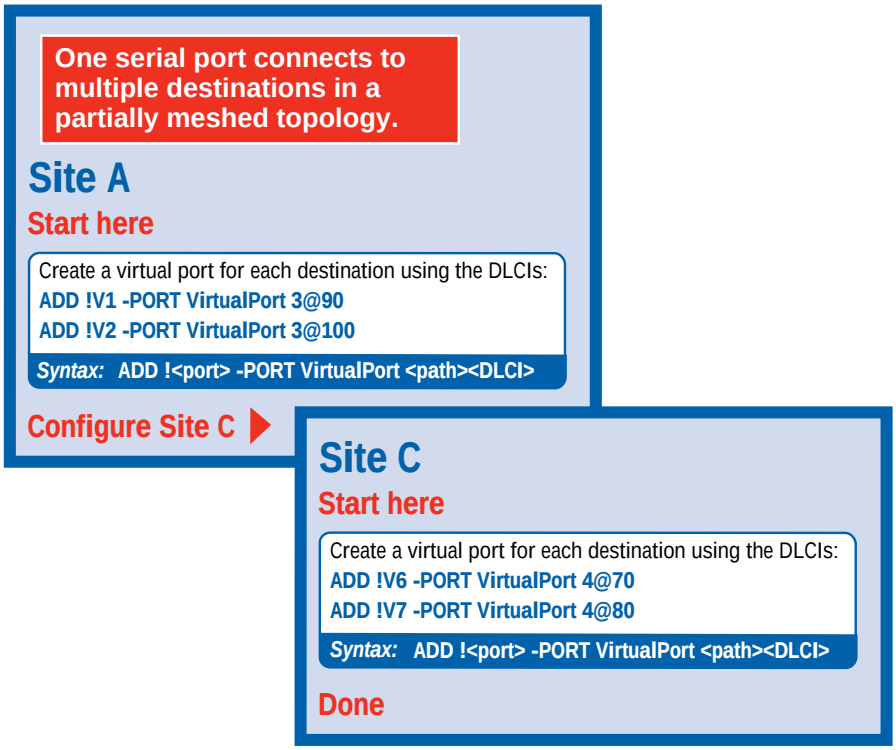
One serial port connects to multiple destinations in a partially meshed topology.
Site A
Start here
Create a virtual port for each destination using the DLCIs:
ADD !V1 -PORT VirtualPort 3@90
ADD !V2 -PORT VirtualPort 3@100
Syntax: ADD !<port> -PORT VirtualPort <path><DLCI>
Configure Site C
Site C
Start here
Create a virtual port for each destination using the DLCIs:
ADD !V6 -PORT VirtualPort 4@70
ADD !V7 -PORT VirtualPort 4@80
Syntax: ADD !<port> -PORT VirtualPort <path><DLCI>
Done

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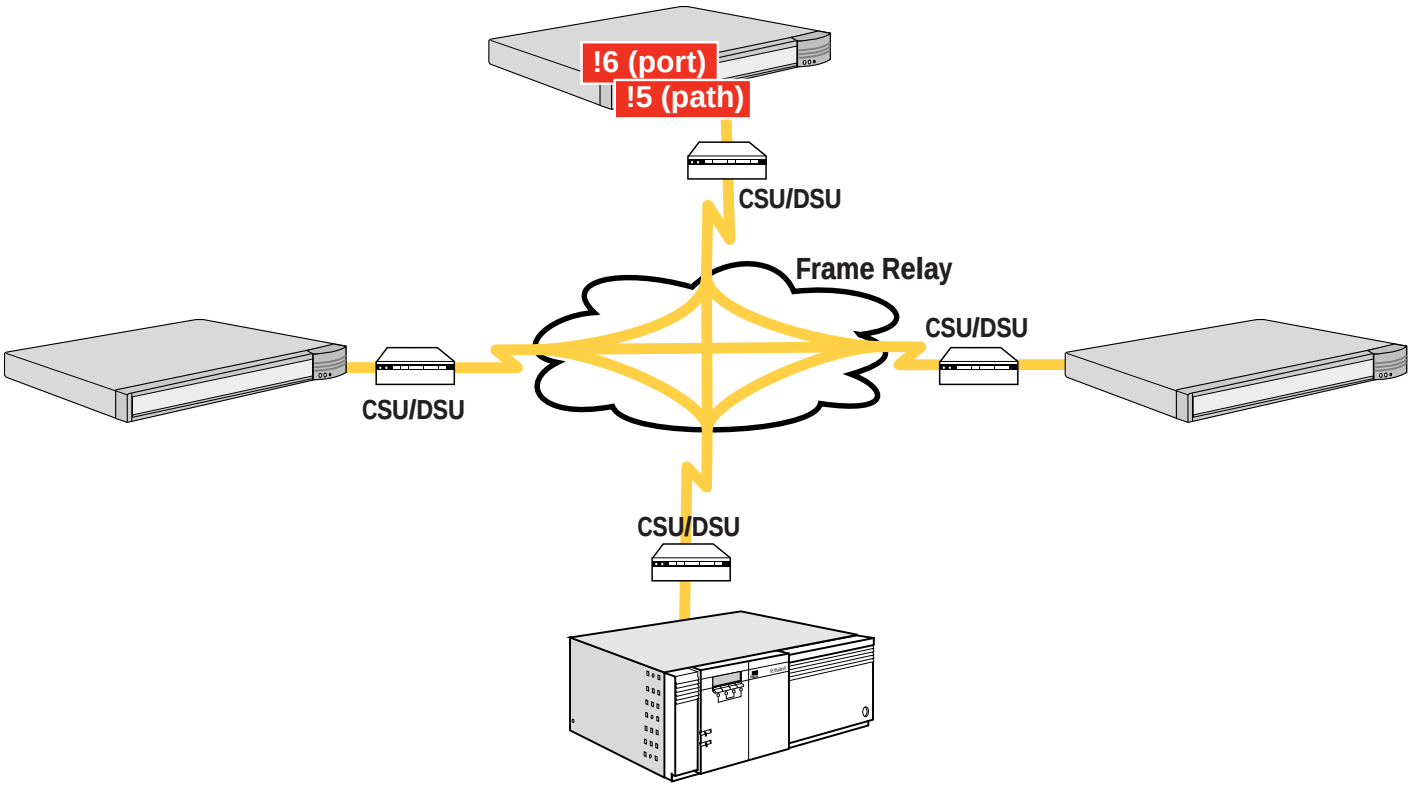
Scenario 3: Fully Meshed Topology

A fully meshed topology consists of bridge/routers that are connected directly to every other bridge/router. Between each bridge/router, you must order a Frame Relay circuit from the service provider.

No configuration is required for this scenario.



Configuring X.25

This section describes two X.25 scenarios:

- Scenario 1: Multiple Destinations, Nonmeshed
- Scenario 2: Fully Meshed Topology

See *Using Enterprise OS Software* to modify the default DTE profile, to create a permanent virtual circuit (PVC), or to configure connection services.

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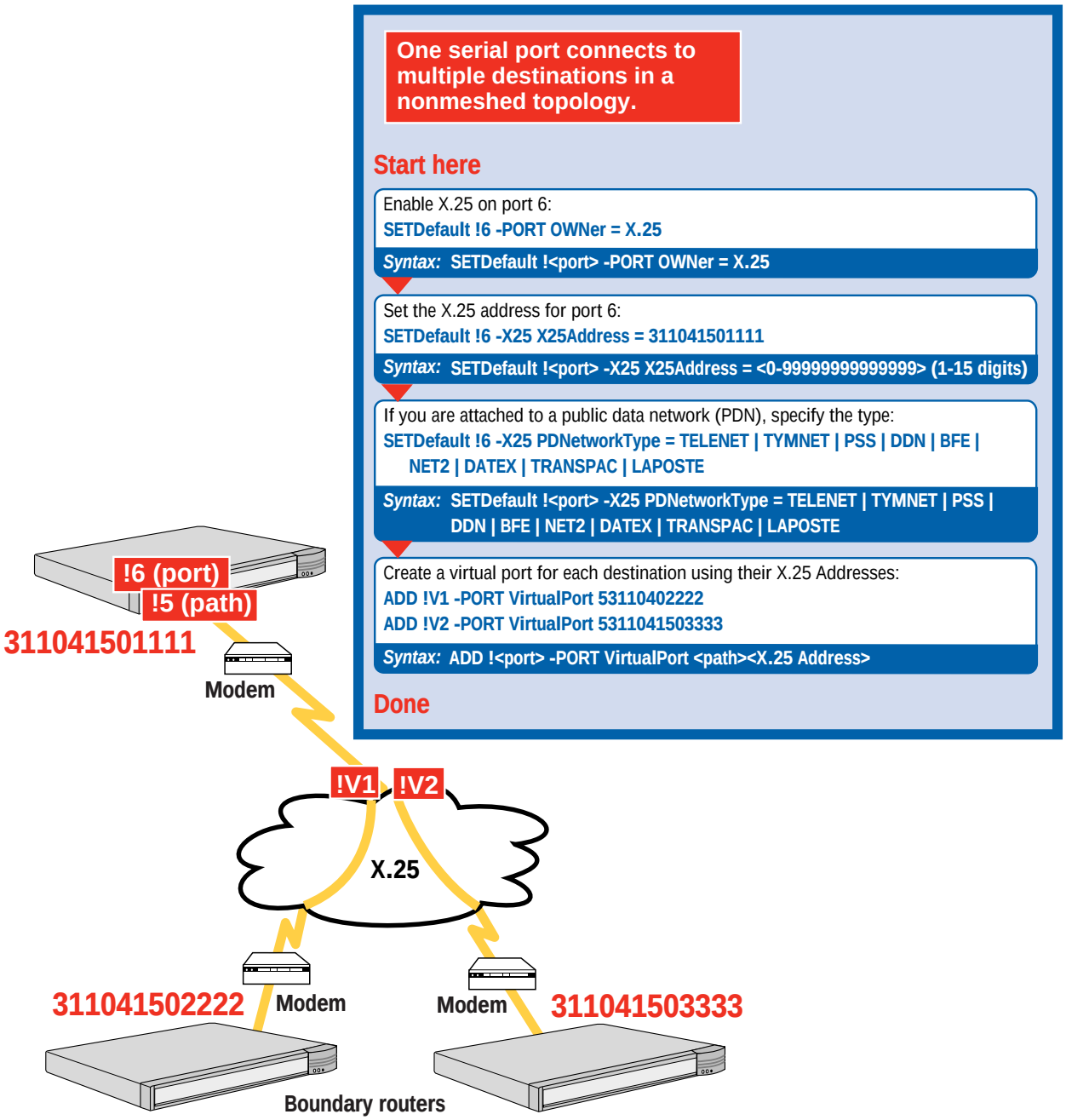
Scenario 1: Multiple Destinations, Nonmeshed

A nonmeshed topology consists of bridge/routers that are not connected directly to every other bridge/router. For example, boundary routers can connect only to the central site. To achieve connectivity between all bridge/routers, create virtual ports for each remote site on the central site.

Obtain an X.25 address from the X.25 service provider for the serial port.


One serial port connects to multiple destinations in a nonmeshed topology.
Start here
Enable X.25 on port 6:
SETDefault !6 -PORT OWNer = X.25
Syntax: SETDefault !<port> -PORT OWNer = X.25
Set the X.25 address for port 6:
SETDefault !6 -X25 X25Address = 311041501111
Syntax: SETDefault !<port> -X25 X25Address = <0-99999999999999> (1-15 digits)
If you are attached to a public data network (PDN), specify the type:
SETDefault !6 -X25 PDNetworkType = TELENET | TYMNET | PSS | DDN | BFE | NET2 | DATEX | TRANSPAC | LAPOSTE
Syntax: SETDefault !<port> -X25 PDNetworkType = TELENET | TYMNET | PSS | DDN | BFE | NET2 | DATEX | TRANSPAC | LAPOSTE
Create a virtual port for each destination using their X.25 Addresses:
ADD !V1 -PORT VirtualPort 53110402222
ADD !V2 -PORT VirtualPort 5311041503333
Syntax: ADD !<port> -PORT VirtualPort <path><X.25 Address>
Done
!6 (port)
!5 (path)
311041501111
Modem
!V1
!V2
X.25
311041502222
Modem
Modem
311041503333
Boundary routers

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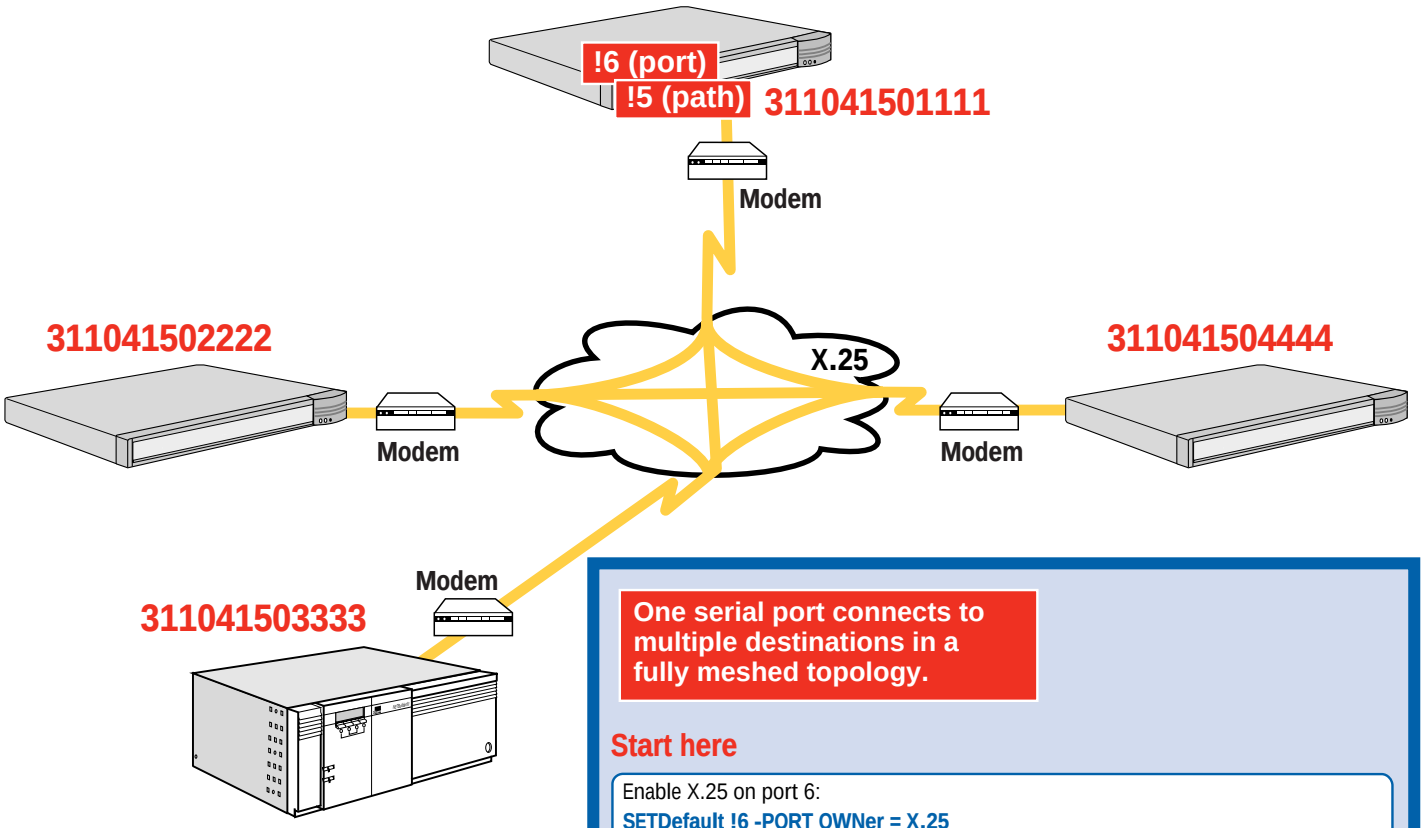
Scenario 2: Fully Meshed Topology

A fully meshed topology consists of bridge/routers that are connected directly to every other bridge/router.

Obtain an X.25 address from the X.25 service provider for the serial port.



One serial port connects to multiple destinations in a fully meshed topology.

Start here

Enable X.25 on port 6:
SETDefault !6 -PORT OWNer = X.25

Syntax: **SETDefault !<port> -PORT OWNer = X.25**

Set the X.25 address for port 6:
SETDefault !6 -X25 X25Address = 311041501111

Syntax: **SETDefault !<port> -X25 X25Address = <0-99999999999999> (1-15 digits)**

If you are attached to a public data network (PDN), specify the type:
SETDefault !6 -X25 PDNetworkType = TELENET | TYMNET | PSS | DDN | BFE | NET2 | DATEX | TRANSPAC | LAPOSTE

Syntax: **SETDefault !<port> -X25 PDNetworkType = TELENET | TYMNET | PSS | DDN | BFE | NET2 | DATEX | TRANSPAC | LAPOSTE**

Done

Where To Go From Here

See Chapter 8 to configure bridging, IP routing, and IPX routing. To configure other protocols, see *Using Enterprise OS Software*.

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8 CONFIGURING BRIDGING AND ROUTING

This chapter provides the following procedures:

- Configuring the Central Node for Boundary Routing
- Configuring Transparent Bridging
- Configuring IP Routing
- Configuring IPX Routing

To configure other routing protocols, see *Using Enterprise OS Software*.

Configuring the Central Node for Boundary Routing

The model 4x7 bridge/router can be used as a central node in a Boundary Routing environment. SuperStack II NETBuilder SI bridge/routers can be used as a central node only for Ethernet boundary routers.

The model 5xx bridge/router does not support leaf node Boundary Routing.

Boundary Routing system architecture treats the remote site as another central site LAN segment, which allows all routing to occur at the central site. Boundary routers require very little or no configuration. You must configure the central site for Boundary Routing by referring to the following chapters in *Using Enterprise OS Software*:

- "Configuring Boundary Routing System Architecture"
- "Configuring Auto Startup"

Configuring Transparent Bridging

When transparent bridging is enabled, the bridge forwards packets based on the destination address in the packets it receives. It also learns and records information about the location and addresses of devices on the surrounding networks, based on the source address in the received packets.

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To enable bridging, enter:

```
SETDefault -BRidge CONTrol = Bridge
```

To customize your bridge, see *Using Enterprise OS Software*.

Managing the Bridge/Router

If you want to access the bridge/router remotely using Telnet or FTP, assign an IP address to port 0 using:

```
SETDefault !0 -IP NETaddr = <IP address>
```

CAUTION: *Do not set an IP address for port 0 if you are using IP routing on the bridge/router.*

Per-Port Transparent Bridging

After enabling transparent bridging on all ports, you can enable or disable transparent bridging on specified ports using:

```
SETDefault!<port>-BRidgeTransparentBRidge=TransparentBRidge|
NoTransparentBRidge
```

Configuring IP Routing

This section contains the following information:

- Assigning Addresses and Enabling IP Routing
- Configuring Static Routes
- Learning Routes with OSPF
- Configuring Route Redundancy
- Assigning Addresses Automatically from BOOTP Servers

To fine-tune your IP router, including configuring an Internet firewall or network address translation, see *Using Enterprise OS Software*.

To use IP, each device on the network must have a unique IP address. To route IP, the bridge/router must have an IP addess assigned to each LAN, WAN, or virtual port.

After assigning IP addresses and enabling IP routing, the bridge/router must use a routing table to identify other routers on the network to send data to. You can create the routing table manually by entering the IP address of each connected router, or you can use a dynamic routing protocol, such as OSPF, that builds the routing table automatically.

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See "Configuring Static Routes" on page 103 to configure routes manually, and "Learning Routes with OSPF" on page 106 to learn routes dynamically.

Assigning Addresses and Enabling IP Routing

To assign addresses and enable IP routing, follow these steps:

1. Assign an IP address for each LAN and WAN port or virtual port that will route IP using:

   ```
   SETDefault !<port> -IP NETaddr = <IP address> [<subnet mask>
    [Ones | Zeros [MTU]]] | UnNumbered
   ```

   If you are using a BOOTP server to obtain your IP addresses, see "Assigning Addresses Automatically from BOOTP Servers" on page 108.

   CAUTION: *An IP address assigned to port 0 is considered the IP address for all the interfaces. As a result, the bridge/router behaves as an IP host for Telnet access and network management and stops routing IP packets. Do not configure an IP address for port 0 if you want to route IP packets*

2. Enable IP routing by entering:

   ```
   SETDefault -IP CONTrol = ROute
   ```

Configuring Static Routes

A static route is a user-defined route by which a network can be reached. If you want to eliminate route advertisements required for dynamic route learning and optimize the use of the available bandwidth on slow serial data links, you must add the route as a static route.

If a destination network is reachable with both a static route and a learned route, the router uses the static route unless you specify the optional Override value in the ADD ROUte command. If a learned route is available, regardless of precedence, it overrides the static route when using the Override value.

You should use static routes only if your network is small and unchanging.

To set a static route, use:

```
ADD -IP ROUte <IP address> [<mask>] {<gateway> | !<port>} <metric>
 [Override]
```

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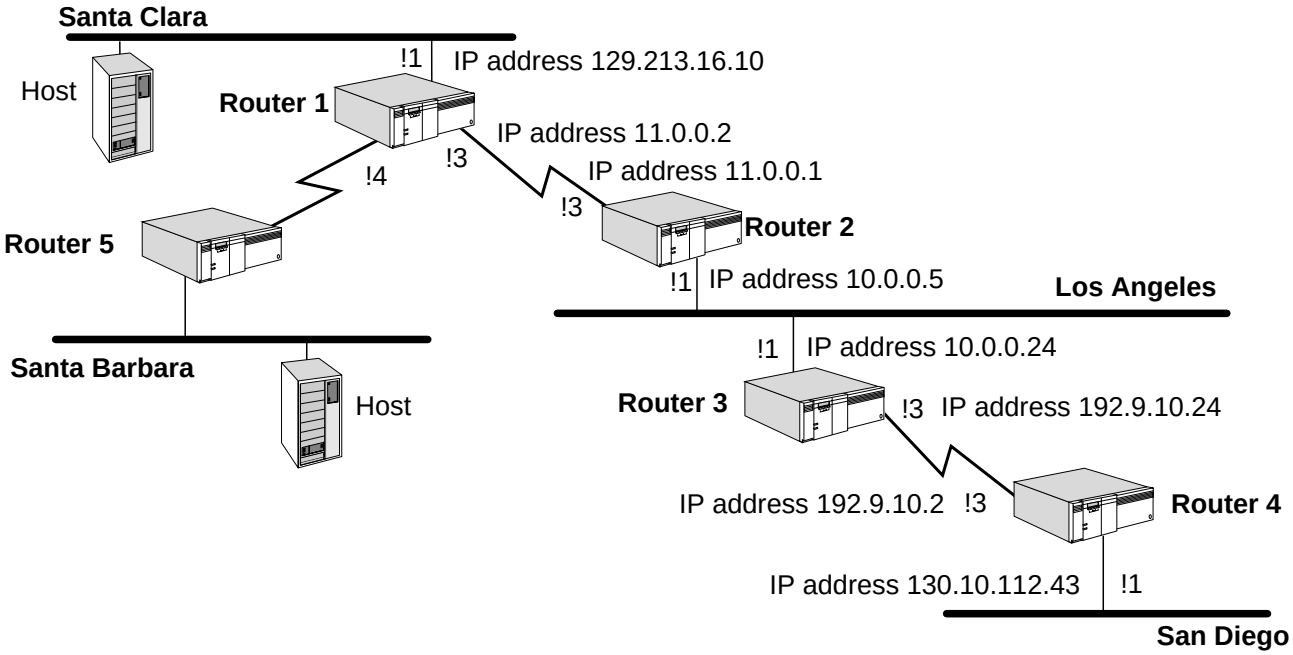
To delete a static route, use:

```
DELete -IP ROUte <IP address> {<gateway> | !<port>}
```

The metric can be the number of routers a packet must travel through to reach its destination, or a number associated with the path cost, for example, speed. The metric is used to determine which route to use if more than one route exists to a destination. The bridge/router uses the lowest metric.

Figure 7 Routing Between Gateways



See the example in Figure 7. On router 1, you can add a static route for the Los Angeles network by entering:

```
ADD -IP ROUte 10.0.0.0 11.0.0.1 1
```

This example shows that network number 10.0.0.0 (the Los Angeles network) is reachable by router 1 through gateway 11.0.0.1 on router 2. The gateway address is the IP address of port 3 on router 2. Because a packet routed from router 1 to the Los Angeles network has to go through one gateway, the metric is 1.

If the outgoing interface is a PPP link, you can add a static route using the outgoing port number instead of the next-hop gateway address. For

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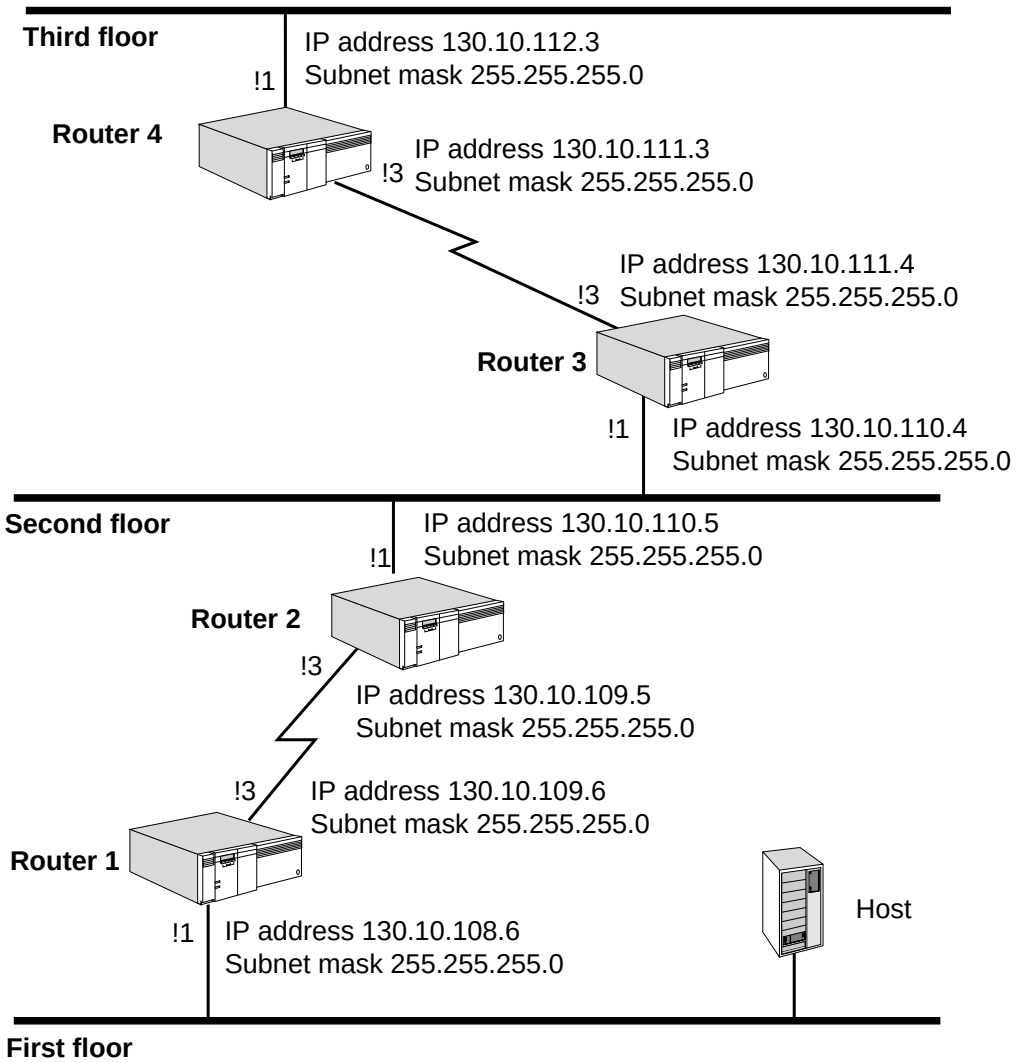
example, on router 1, you can add a static route for the Los Angeles network by entering:

```
ADD -IP ROUte 10.0.0.0 !3 1
```

This command achieves the same results as the command in which you entered the gateway address 11.0.0.1.

Subnet Masks

Figure 8 Adding a Route Statically in a Subnet Masked Environment



You can add a route to a subnet in router 1 using a mask by entering:

```
ADD -IP ROUte 130.10.112.0 255.255.255.0 130.10.109.5 3
```

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This command adds the address 130.10.112.0 with subnet mask 255.255.255.0 to the routing table.

Override Option

If a destination network is reachable with both a static route and a learned route, the router uses the static route unless you specify the optional Override value in the ADD ROUte command. In that case, if a learned route is available to the same network, regardless of metric, it overrides the static route. You should specify Override for a path you want to use for route redundancy. The Override value is entered at the end of the command.

To add the same static route as described earlier with the Override value included, enter:

```
ADD -IP ROUte 130.10.112.0 255.255.255.0 130.10.109.5 3 Override
```

Learning Routes with OSPF

OSPF is a dynamic routing protocol that creates routing tables automatically. For information about other dynamic routing protocols like RIP, see *Using Enterprise OS Software*.

Every 30 minutes or every time the router learns a route change for a network, it uses multicast packets to report to its neighbors the following types of information:

- The networks and the directly connected routers
- The metric associated with each directly connected router and network

In an unchanging topology, OSPF only sends updates every 30 minutes while RIP sends updates every 30 seconds. OSPF provides a significant savings in network overhead when compared to RIP.

To enable OSPF on a specified port, use:

```
SETDefault !<port> -OSPF CONTrol = Enable
```

After OSPF is enabled, the router exchanges routing information with other routers using OSPF.

For more information about fine-tuning your OSPF configuration, see *Using Enterprise OS Software*.

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OSPF over Dial-On-Demand Dial-Up Lines

If you are going to be running OSPF over dial-on-demand dial-up lines, and you do not want the line to come up just for an OSPF packet, configure a demand interface circuit using:

```
SETDefault !<port> -OSPF DemandInterface = Enable
```

With this setting, the router negotiates with the neighbor at the other end of the point-to-point link. If the neighbor agrees that the point-to-point link is a demand circuit, the router suppresses sending OSPF hello packets, which allows the data link connection to be closed when not carrying application traffic. The line will still be brought up every 30 minutes to resynchronize routing table information. For the demand circuit to be cost-effective, make sure that it is isolated from as many topology changes as possible because topology changes bring up the interface.

Configuring Route Redundancy

By configuring route redundancy, you can use a back-up line to route traffic if your primary line fails. To configure a back-up line for route redundancy, configure the line according to Chapter 7 and use either a static route or OSPF. To use other dynamic routing protocols, see *Using Enterprise OS Software*.

Using a Static Route

If you use a static route on the back-up line, but use a dynamic routing protocol like OSPF on the primary line, use the Override option as described in “Override Option” on page 106.

If you are using static routes for both lines, set the metric for the back-up line to a higher number using the syntax in “Configuring Static Routes” on page 109.

Using OSPF

Make sure the metric of the back-up line is higher than the primary line using:

```
SHow [!<port> | !*] -OSPF Cost
```

If the cost for the back-up line is lower than the primary line, set the cost manually to a higher number using:

```
SETDefault !<port> -OSPF Cost = <1-65535>
```

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Assigning Addresses Automatically from BOOTP Servers

If the network administrator at a central site has configured the BOOTP server so that your SuperStack II bridge/router is a BOOTP client, then Internet addresses may have automatically been assigned during the automatic startup process. In this case, no action on your part is required. If you are responsible for configuring the boot configuration file on the BOOTP server so that automatic startup can take place, see *Using Enterprise OS Software*.

To verify whether an Internet address was assigned during the automatic startup process, enter:

```
SHow -IP NETaddr
```

If an Internet address is shown, then the SuperStack II bridge/router has been assigned that address. If an address was not assigned, the following message is displayed:

```
No IP address configured
```

For more information, or if you are unsure if an Internet address has been assigned, contact the network administrator at the central site or your network supplier.

Internet addresses are assigned for individual ports. To verify whether an Internet address was assigned to an individual port, use:

```
SHow !<port> -IP NETaddr
```

When the bridge/router is installed for the first time, BOOTP requests are sent from each connected port requesting a BOOTP server to provide the SuperStack II bridge/router port with its Internet address and other configuration information. The ports continue to send BOOTP requests until the request has been answered. Also, every time a path comes up, if no Internet address has been previously assigned to it, BOOTP requests are sent requesting a BOOTP server to provide an Internet address.

After your bridge/router has been installed for the first time, you can control how it handles BOOTP requests using parameters in the BOOTPC Service. For information on this service, see *Reference for Enterprise OS Software*.

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Configuring IPX Routing

This section includes procedures to enable IPX routing and to optimize IPX for dial-up lines. For information about fine-tuning your IPX configuration, including running IPXWAN on a PPP link between the bridge/router and a NetWare Multi-Protocol Router, and configuring NLSP, see *Using Enterprise OS Software*.

Assigning Addresses and Enabling IPX Routing

To enable IPX routing, follow these steps:

1. Configure the network number for each port routing IPX using:

   ```
   SETDefault !<port> -IPX NETnumber = &<number>(0-FFFFFFFD)
   ```

2. Enable IPX routing for each port using:

   ```
   SETDefault !<port> -IPX CONTrol = ROute
   ```

3. Enable the NLSP dynamic routing protocol using:

   ```
   SETDefault !<port> -NLSP CONTrol = Enable
   ```

Optimizing IPX for Dial-On-Demand Dial-Up Lines

Disable WAN broadcasts to reduce traffic on your dial-on-demand dial-up lines using:

```
SETDefault !<port> -IPX CONTrol = NoWanBcast
```

NoWanBcast causes the IPX router to drop WAN broadcast packets to prevent excessive traffic.

Configuring Static Routes

Routes dynamically learned are automatically purged from the routing table if they are not readvertised within a certain period of time.

If you want to add a route to the routing table that will not be purged from the table, eliminate route advertisements required for dynamic route learning, and optimize the use of the available bandwidth on slow serial data links, you must add the route as a static route.

If a destination network is reachable with both a static route and a learned route, the router uses the static route unless you specify the optional Override value in the ADD ROUte command. If a learned route is available, regardless of precedence, it overrides the static route when the Override value is used.

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The IPX router ignores any dynamic updates or backup routes on the network when a static route is configured for a specific network. Static routes are recommended only where the network topology remains constant.

Define a static route using:

```
ADD !<port> -IPX ROUte {&<remote network> | Default} [<network>]
<media address> <hops> [Override] [hdrfmt]
```

Defining a Default Route

You can configure a static default route, which is subsequently added to the routing table and propagated by NRIP or NLSP. Once a default route is specified, packets destined to unknown networks (networks not explicitly known or listed in the routing table) are routed to the default router for subsequent routing. You can configure only one default route per port.

Use this procedure to configure a default route so that unknown destination packets can be properly forwarded. Define a static default route using:

```
ADD !<port> -IPX ROUte Default <media address> <hops>
```

Override Option

If a destination network is reachable with both a static route and a learned route, the router uses the static route unless you specify the optional Override value in the ADD ROUte command. In that case, if a learned route is available, regardless of precedence, it overrides the static route. You should specify Override for a path you want to use for route redundancy. The Override value is entered at the end of the command.

Configuring Route Redundancy Using a Static Route

If your primary line fails, you can use a back-up line to route traffic by configuring route redundancy.To configure a back-up line for route redundancy, configure the line according to Chapter 7.

If you use a static route on the back-up line, but use a dynamic routing protocol like NLSP on the primary line, use the Override option as described in “Override Option” on page 110.

If you are using static routes for both lines, set the hops for the back-up line to a higher number using the syntax in “Configuring Static Routes” on page 109.

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9 CUSTOMIZING YOUR SOFTWARE

This chapter includes information and procedures to customize your software. This chapter contains the following sections:

- Naming Paths and Ports
- Using the 56/64 Kbps CSU/DSU Module Autobaud Feature
- Working with Dial Number Lists
- Using Statistics on the 56/64 Kbps CSU/DSU Port (45x and 55x)
- Using Statistics on the T1/FT1 RJ-48 Telco Port (46x and 56x)
- Configuring Data Compression

Naming Paths and Ports

To provide a name for your path and port, use:

```
SETDefault !<path> -PATH NAme = “<string>”
SETDefault !<port> -PORT NAme = “<string>”
```

For example, to assign the name Floor_1 to path 1 and the name Bldg_1 to port 1, enter:

```
SETDefault !1 -PATH NAme = "Floor_1"
SETDefault !1 -PORT NAme = "Bldg_1"
```

Path and Port Naming Restrictions

The following restrictions exist for the -PATH and -PORT NAme parameter:

- The name string can contain a maximum of eight characters, the first of which must be alphabetic.
- No blank spaces are allowed in the name string. The only non-alphanumeric characters allowed are the asterisk (*), the underscore (_), the period (.), the dash (-), and the at sign (@).
- Names must be unique within their type. For example, a path name cannot be the same as an existing path name, but it can be the same as an existing port or virtual port name.
- Alphabetic characters are stored and displayed as entered. Names are not case-sensitive when compared on entry with previously entered names. For example, port2 and PORT2 are evaluated as the same name.

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When you define the name parameter, these error messages may be returned:

```
Rejected name - Contains invalid character(s)
Rejected name - Null string not allowed
Rejected name - It is already in use
Rejected name - Must start with alphabetic character
```

Using the 56/64 Kbps CSU/DSU Module Autobaud Feature

This section describes the autobaud feature, which allows the 56/64 Kbps CSU/DSU module to detect the baud rate automatically.

Prerequisites

The two ports of the end bridge/routers must be configured to the same port owners to allow the data link such as PPP to come up at the correct baud rate.

Defaults

The default setting is Autobaud ON.

You can turn off autobaud by setting the baud rate. For example, to set the baud rate to 64 K, enter:

```
SETDefault !2 -PAth BAud=64
```

The autobaud feature is turned off and the CSU/DSU module is set to the defined baud rate only. This terminates any autobaud that has already started.

To turn on autobaud by setting the baud rate to auto, by entering:

```
SETDefault !2 -PAth BAud=AUto
```

Procedure

This example sets up a 56/64 Kbps CSU/DSU module to communicate with the central site NETBuilder router whose baud rate is already configured.

1. Configure the remote site router to the same identical port owner as the central site router.
2. To turn the autobaud feature on at the 56/64 Kbps CSU/DSU module, enter:

```
SETDefault !2 -PAth BAud=AUto
SETDefault !2 -Path CONTrol=ENAble
```

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The following message is displayed at the console:

Commencingautobaudingfor Path2todetermine56or64Kbpsbaudrate"

Working with Dial Number Lists

This section descibes how to configure and customize your dial number list for dial-up lines.

Adding a Phone Number

To allow your bridge/router to dial out, configure the dial number list using:

```
ADD !<port> -PORT DialNoList "<phone no>" [Baud = <rate>
(1.2–16000)] [Type = Modem | Bri | Sw56] | [Pos = <number>]
```

Enter this command for each phone number you want to add to the dial list. If you do not specify a position, the number will be added to the end of the list.

If you are using a dial pool, you may want to have several phone numbers specifying different types (modem, BRI, or Switched 56) or baud rates so if the first number fails on a 28.8 Kbps modem, for instance, the second number is used for a 64 Kbps ISDN line.

You can use hyphens (-) in your phone number. For ISDN, the phone number includes a dial prefix, country code, and area code and possibly a subaddress. If you specify a subaddress, you must separate the phone number from the subaddress with a semicolon (;).

You can configure up to 16 phone numbers per port.

Redialing When the Connection Fails

You can specify the number of times the software attempts to redial the remote system if the call attempt fails using:

```
SETDefault !<port> -PORT DialRetryCount = <number> (0–20)
```

If the first dial attempt fails to bring the path up, the software tries the call again using the same phone number. The call attempts continue until the dial retry count is reached.

Dialing the Same Phone Number Multiple Times

You can configure the dial number list to dial the same number repeatedly by adding multiple copies of the number. Add a different letter after each phone number to distinguish the duplicate entries by entering:

```
ADD !V1 -PORT DialNoList "123-4567"
```

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```
ADD !V1 -PORT DialNoList “123-4567a”
ADD !V1 -PORT DialNoList “123-4567b”
```

The bridge/router dials 123-4567 three times.

Positioning a Phone Number

To insert a phone number into a specific position in the dial number list, enter the Pos (Position) keyword with a non-zero number after the dial string.

For example, to insert a phone number for port 4 into position 2 of the dial number list that contains 10 phone numbers, enter:

```
ADD !4 -PORT DialNoList “510-555-7000” Pos = 2
```

The software inserts the new phone number into position 2. The phone number that was previously in position 2 is now in position 3. If the phone already exists in the dial number list, it will be moved to position 2. You can insert the same phone number twice by using blanks or other redundant characters. You also can include the Baud and Type keywords in any order when inserting phone numbers into the dial number list.

Editing an Existing Phone Number

To edit an existing phone number in the dial number list, you can change the position in the list, change the baud rate, and change the device type.

For example, if port 3 has already been assigned 612-345-3989 in position 2 with a baud rate of 64 kbps, you can change the baud rate by entering:

```
ADD !3 -PORT DialNoList “612-345-3989” Pos = 2 Baud = 14.4
```

Because the dial string is case-sensitive, make sure to match it exactly to successfully edit an existing string when characters other than numbers are used.

Deleting a Phone Number

To remove a phone number from the dial number list, use:

```
DELete !<port> -PORT DialNoList “<phone no>”
```

The phone number is case-sensitive and must be matched exactly.

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Using Statistics on the 56/64 Kbps CSU/DSU Port (45x and 55x)

The 56/64 Kbps CSU/DSU port reports 24 hour statistics in 15 minute samples. These statistics are cumulative from the last reboot or the last time these statistics were flushed, whichever is later.

To view the statistics for the CSU/DSU path, enter:

```
SHow !3 -PATH WanCounters
```

The display looks similar to the following example:

```
CUMULATIVE STATISTICS SINCE LAST FLUSHED OR REBOOTED+

SevErrSecs        0019K
ErrSecs           00020K
ErrFreeSecs       00245M
AvailSecs         00245M
CodeViolate       00168K
LossofSig         00000
OutofFrame        00414K
RemoteLback       00000

LAST 24 HOURS STATISTICS IN 15 MINUTE SAMPLES
              00:15  00:30  00:45  01:00  01:15  01:30  01:45  02:00  02:00
SevErrSecs    00000  00000  00000  00000  00000  00000  00000  00000  00000
ErrSecs       00000  00000  00000  00000  00000  00000  00000  00000  00000
ErrFreeSecs   00000  00000  00000  00000  00000  00000  00000  00000  00000
AvailSecs     00000  00000  00000  00000  00000  00000  00000  00000  00000
CodeViolate   00000  00000  00000  00000  00000  00000  00000  00000  00000
LossofSig     00000  00000  00000  00000  00000  00000  00000  00000  00000
OutofFrame    00000  00000  00000  00000  00000  00000  00000  00000  00000
RemoteLback   00000  00000  00000  00000  00000  00000  00000  00000  00000
```

The error definitions are:

SevErrSecs: The number of seconds of severe errors.
ErrSecs: The number of seconds with errors.
ErrFreeSecs: The number of error-free seconds.
AvailSecs: The number of seconds available for normal operation.
CodeViolate: The number of code violations.
LossofSig: The number of “No pulses received at the network interface”.
OutofFrame: The number of “No framing pattern sync at the network interface”.
RemoteLBack: The number of loopbacks initiated by a remote site.

To flush the statistics displayed by the previous command, enter:

```
FLush !3 -PATH WanCounter
```

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Using Statistics on the T1/FT1 RJ-48 Telco Port (46x and 56x)

The T1/FT1 RJ-48 Telco port reports 24 hour statistics in 15 minute samples. These statistics are cumulative from the last reboot or the last time these statistics were flushed, whichever is later.

Network Statistics

To view the network statistics for the CSU/DSU path, use:

```
SHow !<path> -PATH WanCounters
```

To view the user statistics for the CSU/DSU interface, use:

```
SHow !<path> -PATH UserCounters
```

The displays look similar to the following example:

```
CUMULATIVE STATISTICS SINCE LAST FLUSHED OR REBOOTED+

ES    00001
SES   00019K
UAS   00005
BES   00010
CSS   00020
LOFC  00010
EFS   00245M

LAST 24 HOURS STATISTICS IN 15 MINUTE SAMPLES

      00:15  00:30  00:45  01:00  01:15  01:30  01:45  02:00  02:00
ES    00000  00000  00000  00000  00000  00000  00000  00000  00000
SES   00000  00000  00000  00000  00000  00000  00000  00000  00000
UAS   00900  00900  00900  00900  00900  00900  00900  00900  00900
BES   00900  00900  00900  00900  00900  00900  00900  00900  00900
CSS   00900  00000  00000  00000  00000  00000  00000  00000  00000
LOFC  00000  00000  00000  00000  00000  00000  00000  00000  00000
EFS   00000  00000  00000  00000  00000  00000  00000  00000  00000
```

The error definitions are:

ES The number of errored seconds.
SES The number of severely errored seconds.
UAS The number of unavailable seconds.
BES The number of bursty errored seconds.
CSS The number of controlled slip errored seconds.
LOFC Loss of frame count
EFS The number of error free seconds
BPV The number of bipolar violations (or code violations).
LOS The number of “No pulses received at Network Interface”
OOF The number of “No framing pattern sync at Network Interface”

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User Statistics

To view the user statistics for the T1/FT1 interface, use:

```
SHow !<path> -PATH UserCounters
```

Displays similar to the following will appear:

```
CUMULATIVE STATISTICS SINCE LAST FLUSHED OR REBOOTED+

ES    00001
SES   00019K
UAS   00005
BES   00010
CSS   00020
LOFC  00010
EFS   00245M

LAST 24 HOURS STATISTICS IN 15 MINUTE SAMPLES
```

	00:15	00:30	00:45	01:00	01:15	01:30	01:45	02:00	02:00
ES	00000	00000	00000	00000	00000	00000	00000	00000	00000
SES	00000	00000	00000	00000	00000	00000	00000	00000	00000
UAS	00900	00900	00900	00900	00900	00900	00900	00900	00900
BES	00900	00900	00900	00900	00900	00900	00900	00900	00900
CSS	00900	00000	00000	00000	00000	00000	00000	00000	00000
LOFC	00000	00000	00000	00000	00000	00000	00000	00000	00000
EFS	00000	00000	00000	00000	00000	00000	00000	00000	00000

The error definitions are:

ES The number of errored seconds.
SES The number of severely errored seconds.
UAS The number of unavailable seconds.
BES The number of bursty errored seconds.
CSS The number of controlled slip errored seconds.
LOFC Loss of frame count
EFS The number of error free seconds
BPV The number of bipolar violations (or code violations).
LOS The number of “No pulses received at Network Interface”
OOF The number of “No framing pattern sync at Network Interface”

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Displays similar to the following appear when you enter:

```
SHow !<path> -PATH UserCounters
```

```
EFS Error counter           : 100
Signal State                : AVAILABLE
RLOS                        : No
RLOF                        : No
RAIS                        ‘ No
RMYEL                       : No
RYEL                        : No
TYEL                        : No
Remote Inband Lpbck         : Disabled
Time in current interval    : 100
Current Interval            : ES 00005 SES 00010 BRS 00000 CSS 00001
Current Interval            : LOFC 00001 OOF 00002 BPV 00001 CRC 00004
```

To flush the statistics displayed by the previous command, use:

```
FLush !<path> -PATH UserCounters
```

T1/FT1 Driver Statistics

To show the current statistics of the the T1/FT1 driver, use:

```
SHow !<path> -PATH UserCounterStatus
```

A display similar to the following appears:

```
EFS Error counter         :  100
Signal State              :  AVAILABLE
RLOS                      :  No
RLOF                      :  No
RAIS                      :  No
RMYEL                     :  No
RYEL                      :  No
TYEL                      :  No
Remote Inband Lpbck       :  Disabled
Time in current interval  :  100
Current Interval          :  ES 00005 SES 00010 BRS 00000 CSS 00001
Current Interval          :  LOFC 00001 OOF 00002 BPV 00001 CRC 00004
```

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T1/FT1 Parameter Configuration

Show all T1/FT1 parameters configured using:

```
SHow -PATH T1FT1params
```

A display similar to the following appears:

```
Path !2 T1FrameMode = ESF
Path !2 T1LineCoding = B8ZS
Path !2 T1LineDistance = LH1 -0db
Path !2 T1DS0ChnlBaud = FT164K
Path !2 T1ChannelMap = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
```

Configuring Data Compression

To configure tinygram, history-based, or per-packet data compression, see *Using Enterprise OS Software*.

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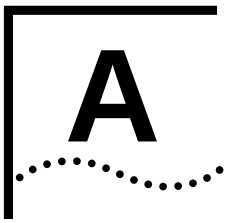

TROUBLESHOOTING

This chapter contains the following sections:

- Using the Monitor Utility
- Normal LED Meanings
- Error LED Meanings
- Performing Loopback Tests
- Performing a Memory Dump

Using the Monitor Utility

If your bridge/router is unable to boot from the software, you can attach a console to the console port and access the firmware monitor utility.

To access the monitor utility from the software, enter:

```
MONitor
```

CAUTION: *The monitor utility stops the software from running, and you must reset the bridge/router to exit the firmware.*

The following commands are available from the monitor utility:

Boot

Syntax

```
BT [<filename> [<config directory>]]
```

Description

The BT command allows you to reboot or to override the default boot path configured in the firmware by the monitor or by the SysconF command in the software. If you enter a new boot path, the firmware parameter is updated to reflect the new path.

If you do not enter a filename or a configuration file directory, the system attempts to boot from boot.68k in the /primary directory. If there is an

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error, a message is sent to the console and you are returned to the boot monitor.

Errors include:

- The file does not exist.
- The file has the wrong format.
- The file has a bad checksum.

Configure Flash Load

Syntax `CL`

Description The CL command allows you to configure the following settings to identify a TFTP server for downloading or dumping memory:

```
1. Client
2. Server
3. Gateway
4. Subnet Mask
5. Boot Filename
6. Port Selection
7. Baud Rate
8. Duplex Mode
```

Clear EEPROM

Syntax `CP`

Description The CP command erases the EEPROM except for the MAC address. You should only do this if advised by 3Com technical support.

Display Files

Syntax `DF [<subdir>]`

Description The DF command displays information about files on a file system or in a specified directory. It also displays the available free space in the file system.

Dump

Syntax `DU`

Description The DU command performs a memory dump to a TFTP server specified in the CL command. See "Performing a Memory Dump" on page 145 to configure a memory dump in the software and to set up the TFTP server.

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Flash Load

Syntax `FL <path/><filename>`

Description The FL command formats the flash memory and uses TFTP to copy the image from the server identified in by CL command to the flash drive.

If you are using BOOTP instead of locally configured addressing in the CL command, you must not include the filename.

Help

Syntax `H`

or

`?`

Description The Help command lists all available commands in the boot monitor along with syntax parameters.

Repeat Last Command

Syntax `!`

Description The ! command repeats the last command entered.

Reset

Syntax `RS`

Description The RS command reboots the system.

Self Test

Syntax `ST`

Description The ST command sets the self-test action to one of the following options:

```
1. Quick
2. Full
```

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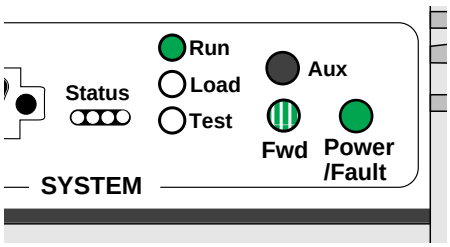
Normal LED Meanings

This section describes the normal operation of the SuperStack II bridge/router LEDs.

System LEDs

The following figure describes the system LEDs.

Normal operation



Power /Fault Lights green when unit has power. Lights amber if there is a problem with power. When unlit, power to unit is off.

Fwd Flashes green each time a packet is forwarded between two ports.

Aux Reserved for future use (model 4xx only).

Run Lights green when the software has successfully loaded and is running.

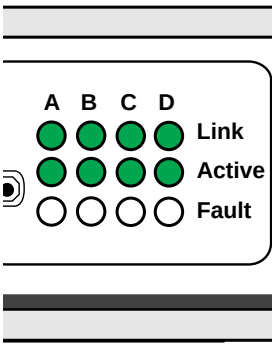
Load Unlit in normal operation. Flashes green during startup to indicate system is loading software. Lights amber when there is a load problem.

Test Unlit in normal operation. Lights amber during startup to indicate system is running self-tests.

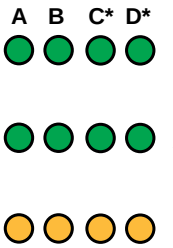
Status Provides additional status for the Run, Load, and Test LEDs.

Serial LEDs

The following figure describes the serial LEDs.



Normal operation



Link Lights green when the path is up.

Active Lights green when there is a physical connection to a serial device such as a CSU/DSU or modem

Fault Unlit in normal operation. Lights amber if an error in the frames is detected.

* Model 5xx only

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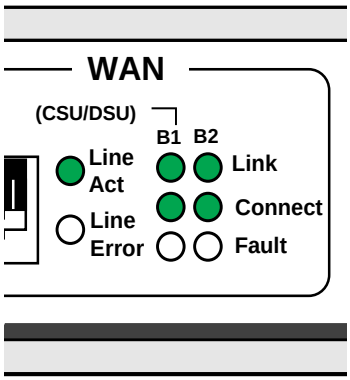
WAN LEDs The following figure describes the WAN LEDs when an ISDN or a CSU/DSU connection is being used.



Normal operation

(CSU/DSU) B1 B2

The CSU/DSU uses only the B1 LEDs.

Link Lights green when the path is up.

Connect Lights green when an end-to-end connection exists or is in progress.

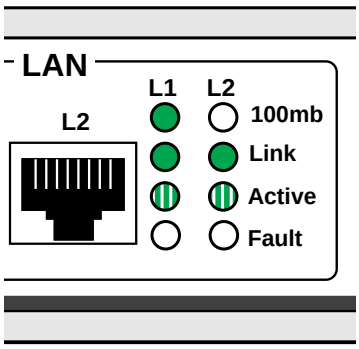
Fault Lights amber when an error in the frames is detected.

ISDN only

Line Act (D channel). Lights green when the ISDN line is activated.

Line Error (D channel). Lights amber to indicate a loss of signal, such as a disconnected cable.

LAN LEDs The following figure describes the LAN LEDs.



Normal operation

L1 L2

100mb Lights green when 100BASE-TX Ethernet is in use.

Link Lights green when the path is up.

Active Flashes green when a packet is detected on the LAN.

Fault Lights amber when a an error is detected or the self-test has failed.

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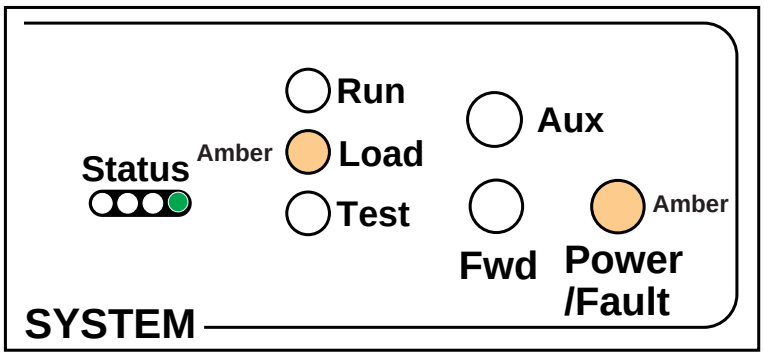
Error LED Meanings

This section describes the error modes of the SuperStack II bridge/router LEDs.

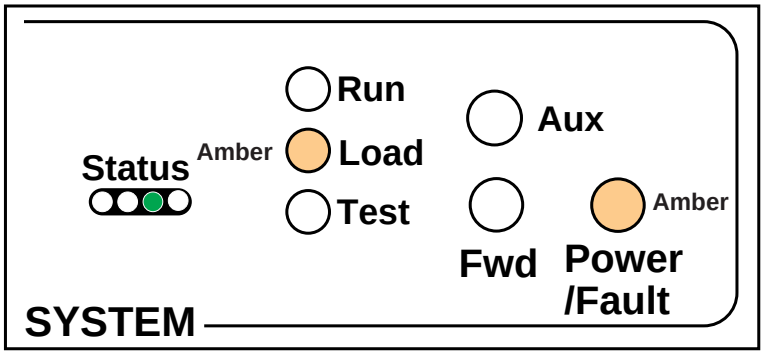
Troubleshooting During the Load Phase

If the Load and Power/Fault LEDs in the System area light amber, a problem occurred during the system software load phase. Compare your System LEDs with the following examples and follow the instructions for troubleshooting.



Meaning: The file system is empty.

Action: Reload the software. See Appendix B.



Meaning: Possible read-only memory corruption; cannot seek file.

Action: Reload the software. See Appendix B.

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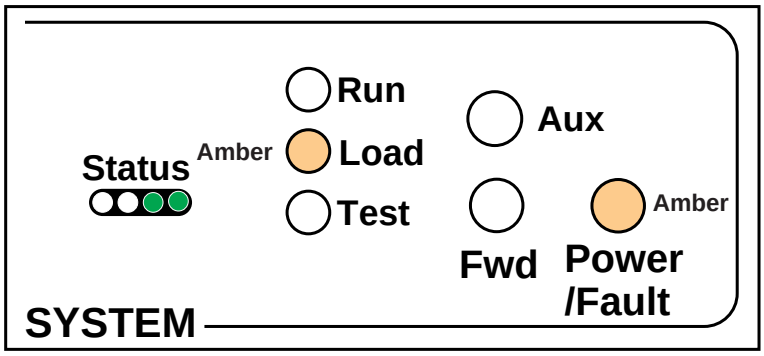


Meaning: The software image file has been deleted or the boot source and image names do not match.

Action: Follow these steps:

1 At the monitor prompt, enter:

```
DF <path>
```

The default path is:

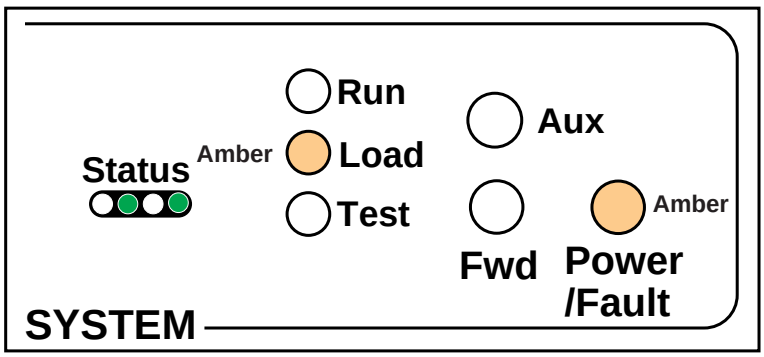
```
DF /primary
```

The image is called boot.68k.

2 If the image has been deleted, reload the software using Appendix B.

3 If the image has a different name or is in a different directory, boot from the image using:

```
BT [<path>]<filename>
```



Meaning: File too large.

Action: Check to see if the file is larger than available memory. Turn the power off and then on again to retry the system software

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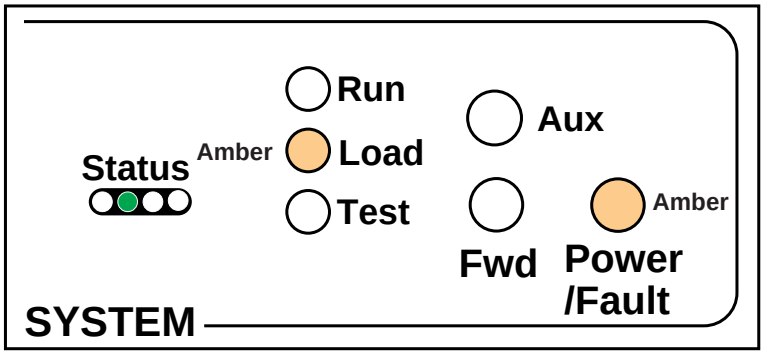
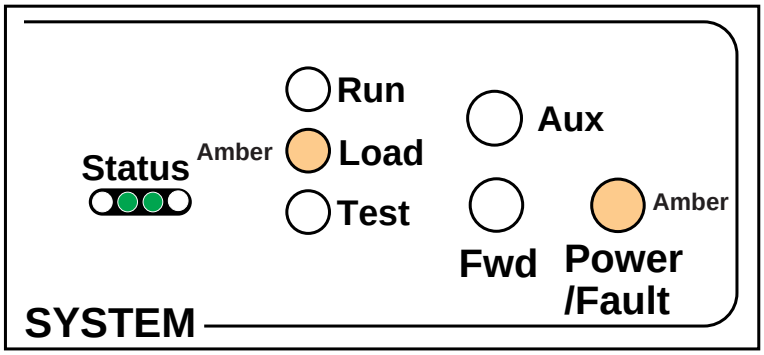
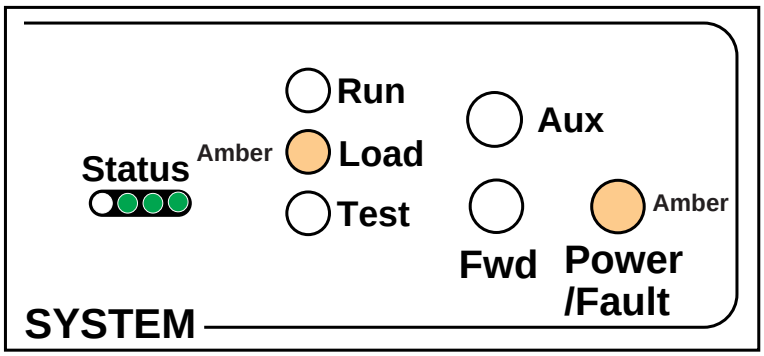
load. If the load is unsuccessful, contact your network supplier.



Meaning: File read or decompression error.
Action: Reload the software. See Appendix B.



Meaning: File checksum error.
Action: Reload the software. See Appendix B.



Meaning: Unspecified fatal error.
Action: Reload the software. See Appendix B.

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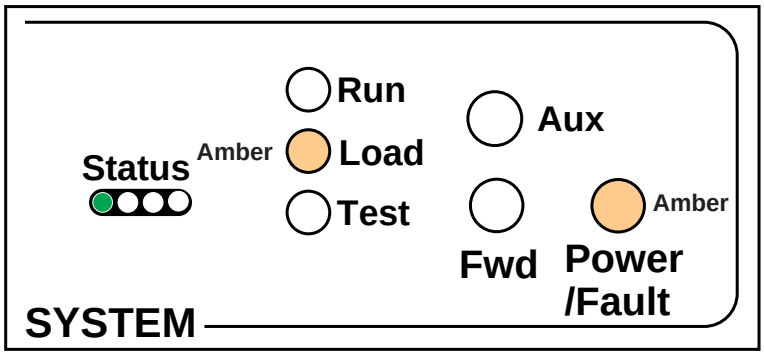
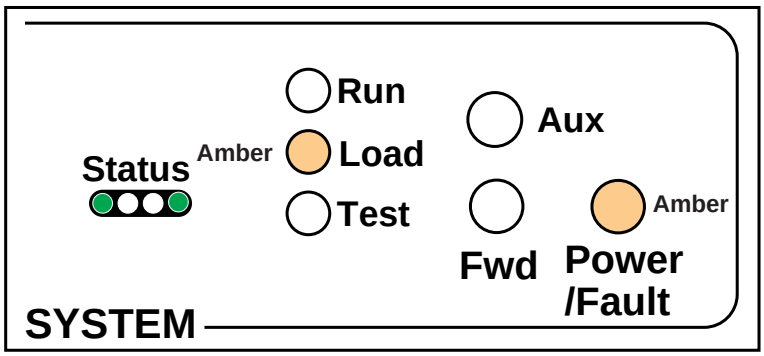


Meaning: Unable to transmit BOOTP request.

Action: Check cable connections. The bridge/router may not be connected correctly to the Ethernet network.



Meaning: No response to BOOTP request. The BOOTP server may not be present or is incorrectly configured.

Action: Check Trivial File Transfer Protocol (TFTP)/BOOTP server configuration and verify the media access control (MAC) address of the bridge/router. Turn the power off and then on again to retry the system software load. If the load is unsuccessful, see Appendix B to reload the system software.

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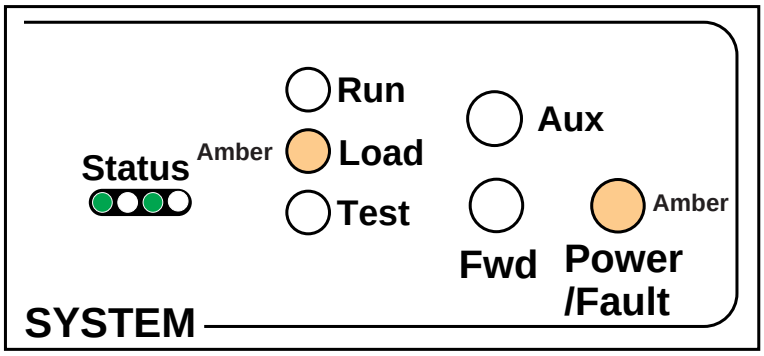
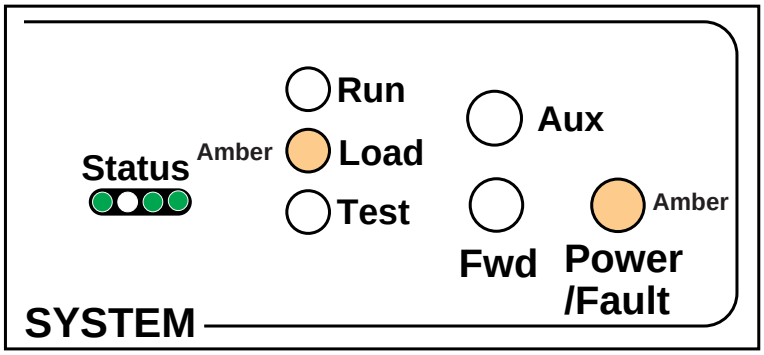


Meaning: No response from the TFTP server to Address Resolution Protocol (ARP) request. The TFTP server is not present or may be incorrectly configured.

Action: Check the TFTP server configuration and verify the MAC address of the bridge/router. Turn the power off and then on again to retry the system software load. If the load is unsuccessful, contact your network supplier for assistance.



Meaning: No response to TFTP request. The TFTP server is not present, the incorrect file was downloaded, or the file is incorrectly configured.

Action: Make sure the MAC address is initialized correctly. Turn the power off and then on again to retry the system software load. If the load is unsuccessful, contact your network supplier for assistance.

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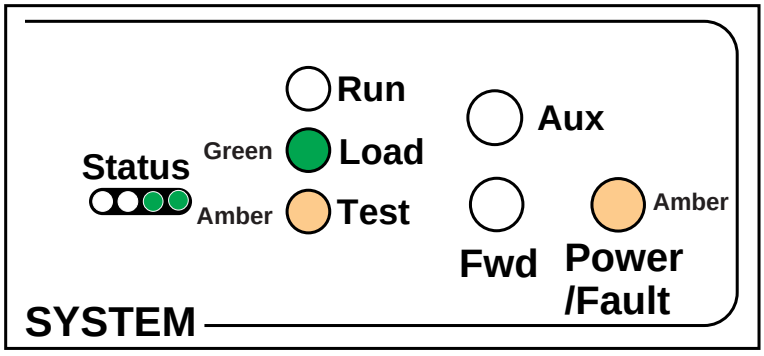
Troubleshooting During the Test Phase

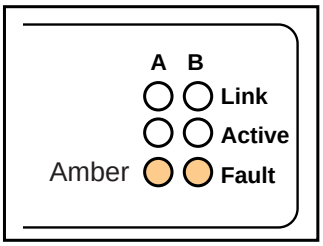
When the software load is complete, the system begins the test phase. If the Test LED lights amber, a problem occurred during the system test phase.



Meaning: EEPROM checksum test failed.
Action: Contact your network supplier.

Errors Indicated by the Serial LEDs

If the Fault LED in the serial LED section of your bridge/router lights amber, it means an error has been detected in a received frame.



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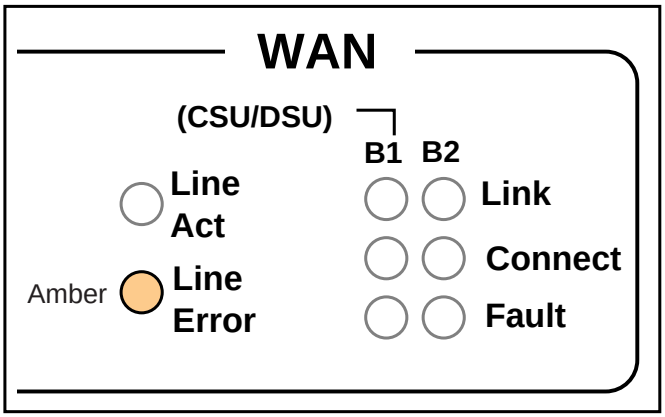
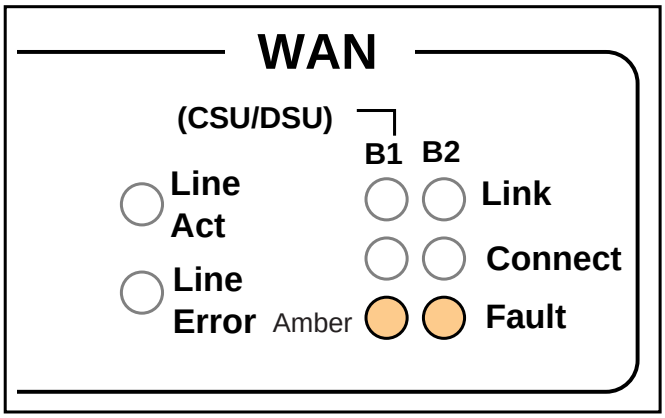
Errors Indicated by the WAN LEDs

This section describes how the WAN LEDs indicate errors on systems using ISDN or CSU/DSU connections.



Meaning: Indicates a loss of signal, possibly due to a disconnected cable.

Action: Check all cable connections.



Meaning: An error in received frames has been detected on either channel B1 or channel B2.

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Performing Loopback Tests

This section describes the bridge/router response to a local loopback assertion and how to perform a loopback diagnostic test on the WAN and serial ports. It also describes the steps required to perform additional types of loopback tests for a T1/FT1 module.

Response to Local Loopback Assertion

If the bridge/router is connected to a DTE that asserts a local loopback signal, the bridge/router displays:

```
Path x Detected DTE Loopback ON, switching to echo mode
```

The bridge/router in echo mode transmits the received data back to the DTE.

When the signal is removed, the bridge/router displays:

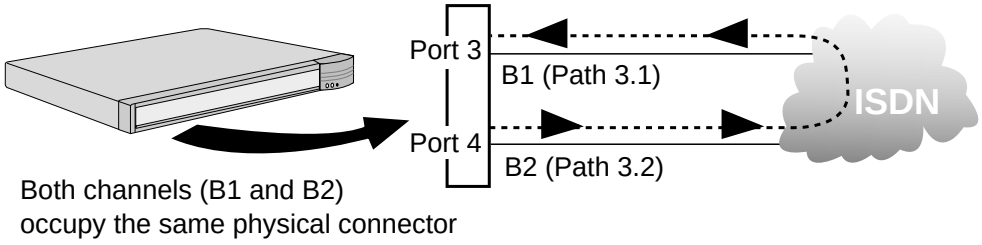
```
Path x Detected DTE Loopback OFF, switching to normal mode
```

Performing a Loopback Test on the ISDN Port (43x, 53x, 44x and 54x)

This section describes how to perform a loopback test on the built-in ISDN port on model 43x, 53x , 44x, and 54x bridge/routers.

Figure 9 shows the data flow that occurs when this loopback test is performed. Both B channels occupy the same physical connector and no TA is required in this configuration.

Figure 9 ISDN Loopback Testing



Prerequisites

Before beginning this procedure, complete the following tasks:

- Attach a console or Telnet to your SuperStack II bridge/router.
- Configure the ISDN port according to "Configuring ISDN on the WAN Port (43x, 44x, 53x, and 54x)" on page 70.

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To perform a loopback test on the built-in ISDN port, follow these steps:

1 Assign each path to separate ports, if necessary, by entering:

```
ADD !3 -PORT PAths 3.1
ADD !4 -PORT PAths 3.2
```

2 Set the rate adaption parameter to automatically detect the speed of the sending interface using:

```
SETDefault !<connectorID.channelID> -PAth RateAdaption = Auto
```

In the example shown in Figure 9, the test originates from path 3.2 and targets 3.1. To specify path 3.2, enter:

```
SETDefault !3.2 -PAth RateAdaption = Auto
```

3 Configure the ports for loopback testing by entering:

```
SETDefault !3 -PORT OWNer = Loopback
SETDefault !4 -PORT OWNer = Loopback
```

4 Add the phone number of path 3.1 to the dial number list of port 4 using:

```
ADD !4 -PORT DialNoList “<phone no>” Baud=64 Type=Bri Pos=1
```

5 Establish a connection between the two B channels by dialing out on one channel and dialing into the other using:

```
DIal !<path>
```

To dial path 3.1 from path 3.2, enter:

```
DIal !3.2
```

Path 3.2 places a call to the number configured in step 4, which is the number for path 3.1. It is not important which port originates or answers the call as long as the port does not try to call itself.

6 When the connection is successfully established, select the loopback testing mode by entering:

```
DLTest TestMode Loopback
```

7 You can specify the number of seconds the test should run. Enter this value any time before entering the DLTest START command. If a value is not specified, an infinite time duration is assumed. To run the test for a specific number of seconds, use:

```
DLTest TestDuration <seconds>
```

Use caution when running for a specified test duration. The test ends abruptly as soon as the time duration expires and a discrepancy between the number of packets transmitted and the number received may result.

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8 Start the DLtest using:

```
DLTest Start <sendingport>, <receivingport>
```

To start the DLTest and designate port 4 to send the DLTest data and port 3 to receive and loop back the data, you would enter:

```
DLtest START 4,3
```

The loopback test is successful when the number of received packets equals or approximately equals the number of transmitted packets. If the test is not successful, verify that your bridge/router is cabled and installed correctly. You can check the number of packets transmitted and the number of errors using:

```
DLTest Stat
```

9 Stop the DLTest by entering:

```
DLTest Abort
```

10 Disconnect the call by entering:

```
HangUp !3.2
```

11 Change the port owner from loopback to PPP by entering:

```
SETDefault !3 -PORT OWNer = PPP
SETDefault !4 -PORT OWNer = PPP
```

12 Delete the phone number from the dial number list for port 4 using:

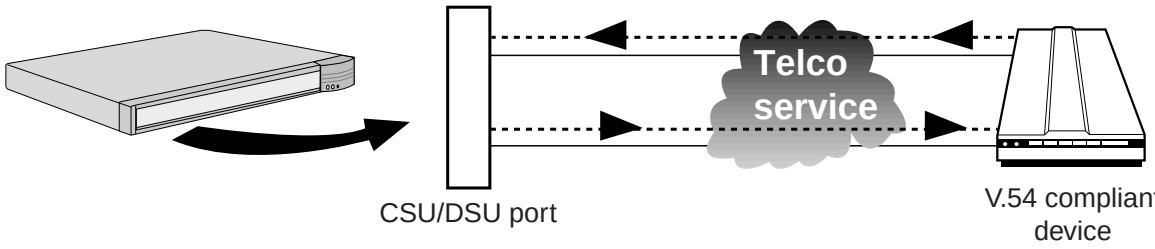
```
DELete !4 -PORT DialNoList “<phone no>”
```

Performing a V.54 Loopback Test on the CSU/DSU Port (45x and 55x)

This section describes how to perform a V.54 loopback test on the built-in 56/64 Kbps CSU/DSU on the model 45x and 55x bridge/router.

Figure 10 shows the data flow that occurs when this loopback test is performed.

Figure 10 CSU/DSU V.54 Loopback Testing



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Before running the CSU/DSU loopback test:

- Attach a console or Telnet to your bridge/router.
- Cable your WAN port to the telco network.
- Make sure the device you are connecting to supports V.54 loopback and is in loopback mode.

To perform a V.54 loopback test on the built-in CSU/DSU, follow these steps:

1. Diasble the path by entering:

   SETDefault !3 -PATH CONTrol = Disable

2. Start the loopback test by entering:

   SET -SYS V54Lback = YES
   SET -SYS V54Lback = START

   The loopback test runs for approximately one minute. If the loopback test was successful, the following message is displayed:

   ```
   V.54 data loopback succeeded
   ```

   If the destination device does not respond, the following message is displayed:

   ```
   V.54 local loopback terminated - remote site not responding
   ```

   If the data is corrupted and the line is not error free, the following message is displayed:

   ```
   V.54 data loopback failed - check for documented errors
   ```

   If this message is displayed, contact your line provider for help.

   If the local unit cannot transmit data at that particular time, the following message is displayed, and you should try again later:

   ```
   V.54 SCC Transmit failed
   ```

3. To stop the loopback test, enter:

   SET -SYS V54Lback = STOP

4. If you want to enable V.54 detection so that a remote unit can initiate a V.54 loopback test, enter:

   SET -SYS V54Lback = YES

5. To disable V.54 detection, enter:

   SET -SYS V54Lback = NO

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6 To determine the current status of the loopback test, either locally-initiated or remotely-initiated, and to determine if the V.54 loopback detection is on, enter:

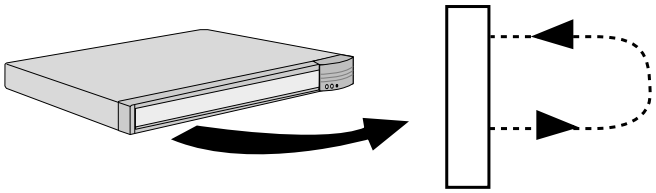
```
SHow -SYS V54Lback
```

Performing a Local Loopback Test on the CSU/DSU Port (45x and 55x)

This section describes how to perform a local loopback test using the loopback plug on the built-in 56/64 Kbps CSU/DSU on the model 45x and 55x bridge/router.

Figure 11 shows the data flow that occurs when this loopback test is performed.

Figure 11 CSU/DSU Local Loopback Testing



Before running the CSU/DSU loopback test, attach a console or Telnet to your bridge/router.

To perform a local loopback test on the built-in CSU/DSU, follow these steps:

1 Uncable the WAN port and insert the loopback plug that came with your system.

2 Set the baud rate to 56 Kbps by entering:

```
SETDefault !3 -PATH Baud = 56
SETDefault !3 -PATH CONTrol = Enable
```

3 Set the owner of the WAN port to loopback by entering:

```
SETDefault !3 -PORT OWNer = LoopBack
```

4 Select the loopback test mode by entering:

```
DLTest TestMode LoopBack
```

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5 Specify the number of seconds that the test should run using:

```
DLTest TestDuration <seconds>
```

If you do not enter a value, the test will run indefinitely. However, use caution when running the test for a specified duration. The test ends abruptly as soon as the time duration expires, and a discrepancy between the number of packets transmitted and the number received may result.

6 Start the loopback test by entering:

DLTest START

If the number of received packets equals or approximately equals the number of transmitted packets, your line has passed the loopback test. If your line does not pass the test, verify that the software is configured correctly. Also, check the number of packets transmitted and the number of errors by entering:

DLTest STATistics

7 Stop the loopback test by entering:

DLTest Abort

8 Restore the owner of the wide area port you are testing from loopback to your protocol using:

```
SETDefault !<port> -PORT OWNer = PPP | FrameRelay | SMDS | Auto
```

Failure to perform this step causes the port to remain in loopback mode preventing connectivity through the port. Performing diagnostics on the port will reveal only that the port is down.

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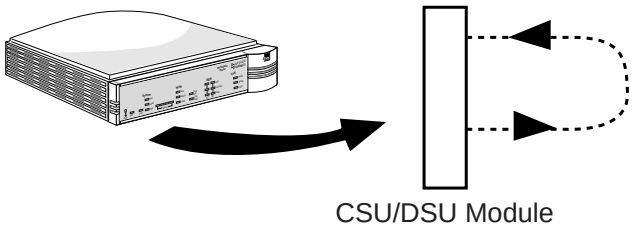
Performing a Remote Loopback Test on a 56/64 Kbps CSU/DSU Module

This section describes how to perform a loopback test on a 56/64 Kbps CSU/DSU module.

Figure 12 shows the data flow that occurs when this loopback test is performed.

Figure 12 CSU/DSU Module Loopback Testing



Before running the loopback test, complete the following tasks:

- Attach a console or Telnet to your bridge/router.
- Cable the CSU/DSU module to the network.
- Verify the path and port number of the port you are testing.

The remote loopback test includes remote CSU Loopback and remote DSU Loopback.

To perform a remote loopback test, follow these steps:

1. Set the baud rate of the port. The default setting of the Autobaud feature is ON. You can turn off autobaud by setting the baud rate. For example, to set the baud rate to 64 Kbps, enter:

   `SETDefault !3 -PAth BAud=64`

   To turn on autobaud, enter:

   `SETDefault !3 -PAth BAud=AUto`

2. Enable the port by entering:

   `SETDefault !3 -PAth CONTrol=ENable`

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3 Start remote loopback test using:

```
RemtLpbck !<path> -PAth [Status | RemtCsuLbkStart |
RemtDsuLbkStart | RemtCsuLbkEnd | RemtDsuLbkEnd ]
```

To start the remote CSU loopback test on path 2, enter:

RemtLpbck !3 -PAth RemtCsuLbkStart

To start the remote DSU loopback test on path 2, enter:

RemtLpbck !3 -PAth RemtDsuLbkStart

4 To view the status of the loopback test in progress, enter:

RemtLpBck !3 -PAth Status

The following fields are displayed:

```
Loopback State :
Loopback Type :
Loopback Time :
Loopback Result :
```

5 To terminate the loopback test, enter:

RemtLpBck !3 -PAth RemtCsuLbkEnd

or

RemtLpBck !3 -PAth RemtDsuLbkEnd

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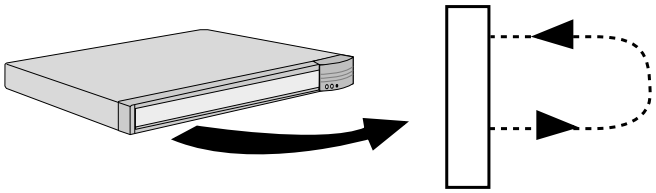
Performing a Local Loopback Test on the T1/FT1 Port (46x and 56x)

This section describes how to perform a local line or payload loopback test using the loopback plug on the T1/FT1port on the model 46x and 56x bridge/router.

Figure 13 shows the data flow that occurs when this loopback test is performed.

Figure 13 T1/FT1 Local Loopback Testing



Before running the T1/FT1 loopback test, attach a console or Telnet to your bridge/router.

To perform a local loopback test on the T1/FT1, follow these steps:

1. Uncable the WAN port and insert the loopback plug that came with your system.
2. Disable the WAN path by entering:

   `SETDefault !3 -PATH CONTrol = Disable`
3. Set the owner of the WAN port to loopback by entering:

   `SETDefault !3 -PORT OWNer = LoopBack`
4. Start the loopback test by entering:

   `LPBCK !3 -PATH LclLnLpbckSTART` (for a line loopback test)
   or
   `LPBCK !3 -PATH LclPyldLpbckSTART` (for a payload loopback test)

   If the number of received packets equals or approximately equals the number of transmitted packets, your line has passed the loopback test. If your line does not pass the test, verify that the software is configured correctly. Stop the loopback test by entering:

   `LPBCK !3 -PATH LclLnLpbckSTOP` (for a line loopback test)
   or
   `LPBCK !3 -PATH LclPyldLpbckSTOP` (for a payload loopback test)

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5 Reenable the WAN port by entering:

```
SETDefault !3 -PATH CONTrol = Enable
```

Failure to perform this step causes the port to remain in loopback mode preventing connectivity through the port. Performing diagnostics on the port will reveal only that the port is down.

Performing a Remote Loopback for V.54 on a T1/FT1 Port

To perform a remote loopback test for V.54 on a T1/FT1 port, you must first connect two SuperStack II NETBuilder SI bridge/routers, or connect your bridge/router to a remote device that supports V.54 signal detection.

To perform the remote loopbacktest for V.54, follow these steps:

1 Disable the WAN path by entering

```
SETDefault !3 -PATH CONTrol = Disable
```

2 Enable V.54 signal detection by entering:

```
LPBCK !3 -PATH V54LpbckYes
```

3 Start the loopback test by entering:

```
LPBCK !3 -PATH V54LpbckSTART
```

4 Stop the loopback test by entering:

```
LPBCK !3 -PATH V54LpbckSTOP
```

Performing a Remote ATT Loopback Test on the T1/FT1 Port

This section describes how to perform a remote loopback test for ATT on a T1/FT1 port. Connect your bridge/router to a remote device that supports ATT.

To perform the remote loopback test for ATT, follow these steps:

1 Disable the WAN path by entering:

```
SETDefault !3 -PATH CONTrol = Disable
```

2 Start the loopback test by entering:

LPBCK !3 -PATH RmATTLnLpbckSTART (for a line loopback test)
or
LPBCK !3 -PATH RmATTPyldLpbckSTART (for a payload loopback test)
LPBCK !3 -PATH V54LpbckSTART

3 To stop the loopback test, enter:

LPBCK !3 -PATH RmATTLnLpbckSTOP (for a line loopback test)
or
LPBCK !3 -PATH RmATTPyldLpbckSTOP (for a payload loopback test)

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Performing a Remote ANSI Loopback Test on the T1/FT1 Port

This section describes how to perform a remote loopback test for ANSI on a T1/FT1 port. Connect your bridge/router to another bridge/router or to a remote device that supports ANSI.

To perform the remote loopback test for ANSI, follow these steps:

1. Disable the WAN path by entering

   SETDefault !3 -PATH CONTrol = Disable

2. Start the loopback test by entering:

   LPBCK !3 -PATH RmANSILnLpbckSTART (for a line loopback test)
   or
   LPBCK !3 -PATH RmANSIPyldLpbckSTART (for a payload loopback test)
   LPBCK !3 -PATH V54LpbckSTART

3. To stop the loopback test, enter:

   LPBCK !3 -PATH RmANSILnLpbckSTOP (for a line loopback test)
   or
   LPBCK !3 -PATH RmANSIPyldLpbckSTOP (for a payload loopback test)

QRSS Testing on a T1/FT1 Port

This section describes the commands used to start and stop QRSS testing on a T1/FT1 port.

To enable QRSS testing, enter:

QrssTest !3 -PATH QrssEnable

To stop QRSS testing, enter:

QrssTest !3 -PATH QrssDisable

To insert a single error, enter:

QrssTest !3 -PATH SingleErrInjStart

To stop inserting single errors, enter:

QrssTest !3 -PATH SingleErrInjStop

To insert continuous error streams, enter:

QrssTest !3 -PATH ContErrInjStart

To stop inserting continuous error streams, enter:

QrssTest !3 -PATH ContErrInjStop

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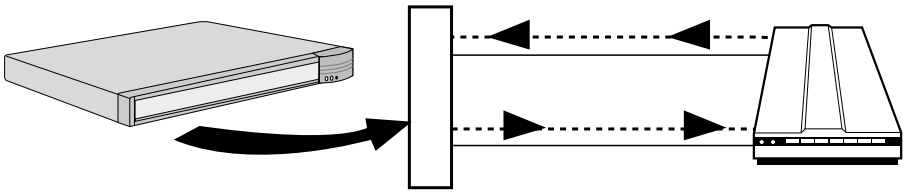
Performing a Loopback Test on a Serial Port

This section describes how to perform a loopback test on a serial port.

Figure 14 shows the data flow that occurs when a loopback test is performed on a serial line. A modem or CSU/DSU is required in this configuration.

Figure 14 Serial Loopback Testing



Before running the serial loopback test, complete the following tasks:

- Attach a console or Telnet to your bridge/router.
- Place the modem or CSU/DSU in local loopback test mode. For information, see the documentation that accompanies your modem or CSU/DSU.
- Verify the path and port number of the serial port you are testing by referring to Table 14 or Table 15 on page 69.

To perform a loopback test on the serial port, follow these steps:

1 Set the line type to Leased using:

```
SETDefault !<path> -PATH LineType = Leased
```

2 Set the owner of the serial port you are testing to LoopBack using:

```
SETDefault !<port> -PORT OWNer = LoopBack
```

3 Select the loopback test mode by entering:

```
DLTest TestMode LoopBack
```

4 Specify the number of seconds that the test should run using:

```
DLTest TestDuration <seconds>
```

If you do not enter a value, the test will run indefinitely. However, use caution when running the test for a specified duration. The test ends abruptly as soon as the time duration expires, and a discrepancy between the number of packets transmitted and the number received may result.

5 Start the serial loopback test by entering:

```
DLTest START
```

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If the number of received packets equals or approximately equals the number of transmitted packets, your serial line has passed the serial loopback test. If your serial line does not pass the test, verify that your bridge/router is cabled correctly and that the software is configured correctly. Also, check the number of packets transmitted and the number of errors by entering:

```
DLTest STATistics
```

6 Stop the serial loopback test by entering:

```
DLTest Abort
```

7 Restore the owner of the wide area port you are testing from loopback to your protocol using:

```
SETDefault !<port> -PORT OWNer = PPP | FrameRelay | SMDS | Auto
```

Failure to perform this step causes the port to remain in loopback mode preventing connectivity through the port. Performing diagnostics on the port will reveal only that the port is down.

Performing a Memory Dump

If a SuperStack II bridge/router unexpectedly stops functioning, it performs a memory dump. A memory dump provides a view of the internal state of the system, which can help Technical Support determine the cause of the failure.

By default, the system performs a partial dump to available flash memory. If you want a full dump to a TFTP server on the local Ethernet network, you must have the following items available:

- IP addresses and subnet masks of the SuperStack II bridge/router, TFTP server, and possibly, the gateway leading to the network segment where the TFTP server is located
- A TFTP server on the local Ethernet network
- Authorization to write to the TFTP server
- 10 MB of available disk space on the TFTP server
- The SuperStack II bridge/router configured to dump to the TFTP server

The procedure to obtain a memory dump involves setting up destination IP addresses and a file to hold the memory dump information. The bridge/router uses the IP addresses to transmit the memory dump in a file across the network to a TFTP server.

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Notice to users with UNIX TFTP servers: Some UNIX TFTP servers do not have the capability to create files if they do not exist, but can overwrite an existing file. Therefore, you must first create a file with the expected dump file name on the UNIX TFTP server. The procedure for creating such a file is described in "Creating a File for the Memory Dump" on page 147.

Configuring the Dump Destination

The Dump Destination parameter selects where the contents of bridge/router memory are stored in case of a crash.

1. Connect to the bridge/router through the Console port or through Telnet.
2. At the Enterprise OS # prompt, enter:

   SysconF

3. Select Dump Configuration Menu from the System Configuration menu. The default parameters are shown in bold:

```
1. Port Selection          LAN1
2. Baud Rate               Auto Baud
3. Duplex Mode             Auto Duplex
4. Dump Destination        No Full Dump
```

4. Select Dump Destination.

   The following options are available:

```
1. No Full Dump
2. Network
```

5. If you select No Full Dump, the system performs a partial dump to the FPROM. You do not have to complete the rest of this procedure.
6. If you want a full dump to the network, select Network.

   The following options are available for Network:

```
1. Client
2. Server
3. Gateway
4. Remote File Server (not applicable)
5. Subnet Mask
6. Dump Destination Directory
```

7. Set the IP addresses for the client, server, gateway, and subnet mask.
   a. Select Client and enter the IP address associated with the Ethernet port of the bridge/router.
   b. Return to the Dump Destination menu and select Server and enter the IP address associated with the TFTP server.

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c If necessary, select Gateway from the Dump Destination menu and enter the IP address of the default gateway leading to the network on which the TFTP server resides.

d If subnet masks are in use, select Subnet Mask from the Dump Destination menu and enter the subnet mask associated with the IP network attached to the Ethernet port.

8 Select Dump Destination Directory on the Dump Destination menu to configure the location on the TFTP server to which the dump file will go.

The default destination is /dump.

9 Enter the target directory on the TFTP server.

Usually, the target directory is the default TFTP directory. For example, if the TFTP directory is /home/TFTPdir, and the target directory configured on the bridge/router is /dump, then the actual target directory is /home/TFTPdir/dump. Make sure this directory exists on the TFTP server, as it will not be created by the bridge/router, or the TFTP process when a TFTP transfer is initiated.

10 Type Q repeatedly to exit the System Configuration menus and return to the Enterprise OS # prompt.

Obtaining the MAC Address

You need to obtain the media access control (MAC) address of the SuperStack II NETBuilder SI bridge/router. This is necessary because the system creates a dump file on the TFTP server named dmXXXXXX.dmp, where XXXXXX are the last six characters of the MAC address of the Ethernet port (port 1) of the bridge/router.

To display the MAC addresses, follow these steps:

1 At the Enterprise OS # prompt, enter:

```
SysInfo
```

2 Record the MAC address for port 1 when it is displayed. You will use this number in the next procedure.

Creating a File for the Memory Dump

Some UNIX TFTP servers do not have the capability to create files if they do not exist, but can overwrite an existing file. Therefore, you must first create a file with the expected dump file name on the UNIX TFTP server.

Before beginning this procedure, make sure the TFTP server is running. On a UNIX system, the ps command with appropriate arguments provides a listing of the current processes. See your documentation pertaining to the IP stack on the TFTP server if you have any problems.

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To create a memory dump file, follow these steps:

1. On a UNIX TFTP server, create a file with the name dmXXXXXX.dmp, where XXXXXX is the last six characters of the MAC address of the Ethernet port (port 1) of the SuperStack II bridge/router.

   For example, if the last six characters of the MAC address of the bridge/router are 06BA6A, enter:

   `touch dm06BA6A.dmp`

2. Ensure that all users have permission to write to the target directory and filename. To determine this on a UNIX system, enter:

   `ls -a`

3. To change write access permissions on a file or directory, enter:

   `chmod 666 dm06BA6A.dmp`

   See the UNIX system documentation if you have any problems.

Verifying the TFTP Process

To verify that a TFTP transfer can occur from the SuperStack II bridge/router to the TFTP server, follow these steps:

1. Obtain a listing of the files on the SuperStack II bridge/router to select one to transfer using:

   ```
   df <directory>
   ```

2. If you are using a UNIX TFTP server, create a zero byte file with the name of the file you selected, and with the proper permissions, using:

   ```
   touch <filename>
   chmod 666 <filename>
   ```

3. Transfer the selected file from the bridge/router to the TFTP server using:

   ```
   COpy [<device>:]<src_filename> [<device>:][<dest_filename>]
   ```

   For example, to copy a source file named system to destination /dump/ using the TFTP server at IP address 139.88.132.192, enter:

   `COpy a:/primary/system 139.88.132.192:/dump/system`

4. Verify that the file was transferred to the correct location on the TFTP server.

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Verifying the Memory Dump Procedure

To verify that the memory dump process works, simulate a failure of the SuperStack II bridge/router. At the Enterprise OS # prompt, enter:

```
su dm ffffff
```

The system responds with the following information:

```
Bus Error
Address = 0xFFFFFF
Status word = 0x0015
Instruction = 0x1012
PC = 0x4A2244
Dumping memory to network ... Dumping to file -
Trying AUI port ...
No Carrier on AUI port trying 10BaseT port ... carrier detected
TFTP write of file to server 139.87.132.101
Beginning transfer 4096 ... done
System Reset
Resetting System
```

If you receive a similar display, your bridge/router is configured correctly to obtain a memory dump. If you receive a different display, try these procedures again. Contact 3Com Technical Support for additional assistance.

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B

RELOADING THE SYSTEM SOFTWARE

This chapter describes how to reload your system software if the following conditions occur:

- The boot image has been accidentally deleted or corrupted.
- The device is unable to boot.

To reload the software, you must have the software installed on a trivial file transfer protocol (TFTP) server on the LAN. You can also use a TFTP/ Bootstrap Protocol (BOOTP) server.

Install the software on your server from the CD-ROM.

The loading procedure in this chapter:

- Reformats the flash memory.
- Looks up the IP address of the server.
- Transfers the boot.68k file from the server.
- Creates the /primary directory.
- Places the image in the /primary directory.

Reloading the Software

You must have a console attached to your SuperStack II NETBuilder SI bridge/router to reload the system software from the backup CD-ROM.

To reload the system software, follow these steps:

1 Reset the bridge/router by turning the power switch off and on again.

If the boot image has been accidently deleted or corrupted, the bridge/router should go into monitor mode, which is indicated by an angle bracket prompt (>). Go on to the next step.

If the bridge/router does not go into monitor mode, then contact your network supplier. You do not need to complete the remaining steps.

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2 If you are using a TFTP server (without BOOTP), enter:

CL

The CL command allows you to configure the following settings:

```
1. Client
2. Server
3. Gateway
4. Subnet Mask
5. Boot Filename
6. Port Selection
7. Baud Rate
8. Duplex Mode
```

When addressing is configured using the CL command, you do not need to use a BOOTP server to acquire addresses. If you do not use the CL command, a BOOTP server must be available on the local LAN with an entry in its database for this device.

3 If you are using a TFTP server without BOOTP, enter:

FL <path/>boot.68k

If you are using a TFTP/BOOTP server, enter:

FL

The FL command formats the flash memory and uses TFTP to copy the image from the identified server to the flash drive.

If you are using BOOTP instead of locally configured addressing in the CL command, you must not include the filename.

4 When the flash load is complete, confirm that boot.68k was copied onto the bridge/router by entering:

DF /primary

If you do not see boot.68k, or if there is no /primary directory, contact technical support.

5 Reset the bridge/router by pressing the Power switch on the back panel off then on.

Load Errors

During the software loading process, some hardware or software conditions can cause the process to fail. For more information about load errors, see Appendix A.

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C

SYNTAX CONVENTIONS

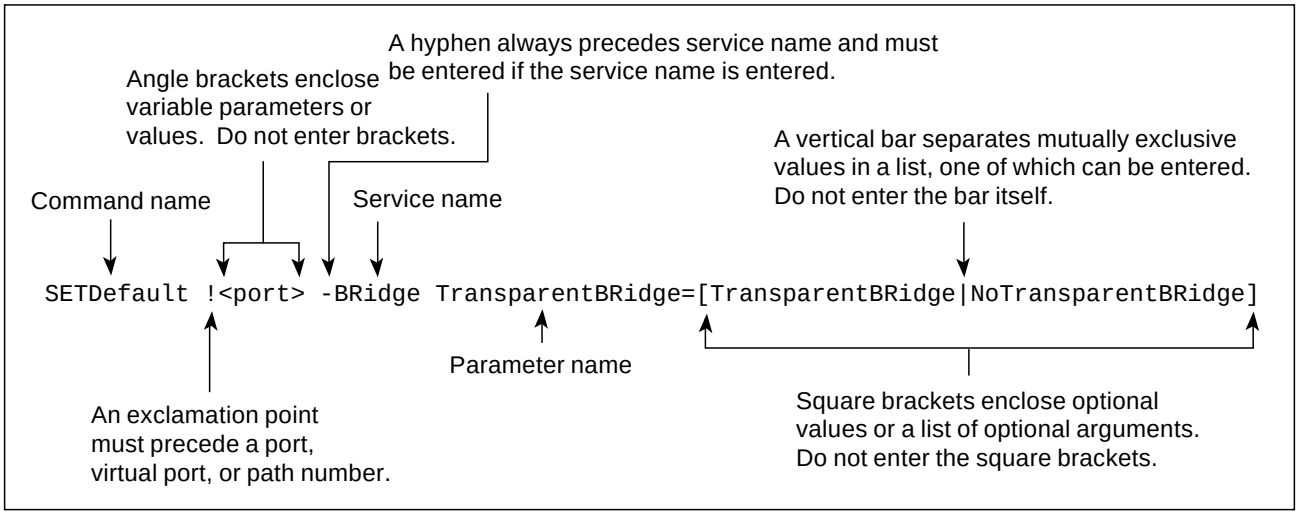
This appendix describes Enterprise OS software syntax conventions.

Full Form Syntax

You can see the full form syntax provided by the online help in the software by typing a question mark (?) or a question mark with other options as described in “Getting Help” on page 160.

Figure 15 is an example of full form syntax and includes callouts to the parts and symbols that make up the command syntax. For more information on symbols, see “Symbols” on page 154.

Figure 15 Full Form Syntax


A hyphen always precedes service name and must be entered if the service name is entered.
Angle brackets enclose variable parameters or values. Do not enter brackets.
A vertical bar separates mutually exclusive values in a list, one of which can be entered. Do not enter the bar itself.
Command name
Service name
SETDefault !<port> -BRidge TransparentBRidge=[TransparentBRidge|NoTransparentBRidge]
Parameter name
An exclamation point must precede a port, virtual port, or path number.
Square brackets enclose optional values or a list of optional arguments. Do not enter the square brackets.

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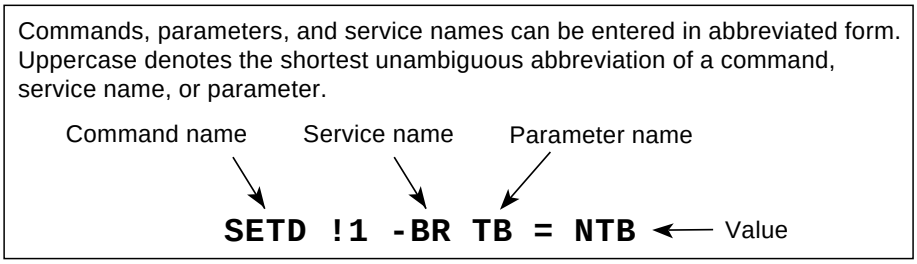
Abbreviated Syntax

The abbreviated syntax shown in uppercase is the shortest unambiguous abbreviation of a command, parameter, or value that can be entered. You can enter the abbreviated form in lower- or uppercase letters at the Enterprise OS prompt.

Figure 16 shows the abbreviated version of the syntax shown in Figure 15.

Figure 16 Abbreviated Syntax


Commands, parameters, and service names can be entered in abbreviated form. Uppercase denotes the shortest unambiguous abbreviation of a command, service name, or parameter.
Command name
Service name
Parameter name
SETD !1 -BR TB = NTB
Value

Additional syntax examples are provided in "Full and Abbreviated Syntax Examples" on page 155.

Symbols

Depending on the command, you may see a variety of symbols as part of the command syntax. These symbols are summarized in Table 18.

Table 18 Command Syntax Symbols

Symbol	Description
angle brackets < >	Enclose a variable or value. You must specify the variable or value; for example, in the syntax: `ADD -SNMP COMmunity <"com.name">` you must supply a name for com.name when entering the command.
square brackets [ ]	Enclose an optional value or a list of optional arguments. One or more values or arguments can be specified. For example, in the syntax: `SET PRIvilege = [User | NetMgr]` you can specify either User or NetMgr when entering the command.
parentheses ( )	Enclose a list of values that can be assigned to a single parameter. At least one of them must be selected. You must enter the parentheses and separate the values with a comma if you are assigning more than one value. For example, in the syntax: `SET CurrentPorts = ALL | (<port>[,<port>])` you can specify two port numbers by enclosing them in parentheses and separating them with a comma when entering the command.

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Table 18 Command Syntax Symbols (continued)

Symbol	Description
vertical bar |	Separates mutually exclusive items in a list, one of which must be entered. For example, in the syntax: `SET ScreenLength = [None | <line>(6–100)]` you can specify either the keyword None or enter a number between 6 and 100 when entering the command.
ellipsis ...	Following a parameter name or value, indicates that one or more additional arguments may be specified on the same command line. For example, in the syntax: `ADD !<port> -IP SecAuthIn <authority> [<authority> ...] [ANY]` you can specify multiple authorities (GENSER, SIOP, SCI, NSA, DOE, NONE) when entering the command.
hyphen -	A letter preceded by a hyphen represents a command option. Also, when you enter a service name as part of the command, you must precede the service name with a hyphen. For example, in the command: **`SETDefault -BRidge CONTrol = Bridge`** the hyphen must be included with the service name BRidge when entering the command.
braces { }	Enclose a list of values, one of which must be entered. For example, in the syntax: `SETDefault !<subaddr #> -Gateway SubAddrMap = {(<IPaddr> | <PSAPaddr>) | None}` you must enter either an IP address, presentation service access point (PSAP) address, or the keyword None when entering the command.
exclamation mark !	A number preceded by an exclamation mark represents a port, virtual port, or path number. For example, in the syntax: `SHow [!<port>] -DECnet CONFiguration` the exclamation mark must be included before the port number when entering the command.

Full and Abbreviated Syntax Examples

The following examples show full form first followed by the abbreviated command syntax.

The full form syntax:

```
ADD !<port> -NRIP AdvToNeighbor <network>%<MAC address> [...]
```

can be abbreviated to:

```
ADD !<port> -NRIP ATN <network>%<MAC address> [...]
```

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The following abbreviated command specifies that a neighbor on port 2 network number &10 with address %080002030ef2 receives Routing Internet Protocol (RIP) and Service Access Point (SAP) updates:

```
ADD !2 -NRIP ATN &10%080002030ef2
```

The full form syntax:

```
SETDefault -IP CONTrol = ([ROute | NoROute], [RelaySrcRoute |
NoRelaySrcRoute], [SplitLoad | NoSplitLoad], [Filtering |
NoFiltering], [SECurity | NoSECurity], [FwdSubnetBcast |
NoFwdSubnetBcast], [FwdAllSubnetBcast] | NoFwdAllSubnetBcast)
```

can be abbreviated to:

```
SETD -IP CONT = ([RO | NRO], [RSR | NRSR], [SL | NSL], [F | NF],
[SEC | NSEC], [FSB | NFSB], [FASB | NFASB])
```

The following abbreviated command enables IP routing, packet filtering, and security:

```
SETD -IP CONT = (RO,F,SEC)
```

For consistency and clarity in the Enteprise OS and NETBuilder family guides, the full form syntax is provided. However, you can use the abbreviated form by only typing the uppercase portion of the command and supplying the appropriate values.

Variations in Command Syntax

Each command has its own syntax. When a command is used for configuring parameters, its syntax or values may change according to the parameter and the service. For example, the SETDefault command sets the NetMapTime parameter in the SYS Service and the MaxAge parameter in the STP Service. In the following example, the general command syntax is followed by the syntax variations (different values for different parameters) appropriate to the parameter associated with a service:

```
SETDefault <parameter> = <value>
SETDefault -SYS NetMapTime = <number> (0 to 120 seconds)
SETDefault -STP MaxAge = <seconds> (6–40)
```

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Entering Service Names in Command Lines

When you are configuring or displaying a parameter, service names must be provided to differentiate commands that appear in more than one service. The service name may be entered in abbreviated form. The service name must be preceded by a hyphen. For example, to indicate BRidge Service, type -br.

Abbreviated service names are indicated in uppercase in this guide.

There are three exceptions:

- If you have previously set the CurrentServices parameter to the desired service, you do not need to enter the service name. The system prompt indicates the current service if a single service was set with the CurrentServices parameter. If multiple services are set, the system prompt is displayed. For information on using the CurrentServices parameter, see *Reference for Enterprise OS Software*.
- If the command is for a Global parameter, (the command affects the entire system environment) you must not specify a service name. For descriptions of those parameters affecting the system, see *Reference for Enterprise OS Software*.
- If the parameter name is unique.

Using Aliases

To avoid entering lengthy commands at the prompt, you can customize the command name using an alias. You can create an alias to represent any command. Use the following syntax to define an alias:

```
ADD -SYS ALias <aliasname> <arguments ...>
```

For example, if you use the SHow -SYS NetMAP command often, create an alias called ntmap by entering:

```
ADD -SYS ALias NTMAP SHow -SYS NetMAP
```

Each time you want to display the network map, enter:

```
ntmap
```

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Command History Substitution

The bridge/router "remembers" the 10 most recent commands you entered. To display a list of these commands, enter:

```
SHow History
```

To repeat any of the commands displayed, use the event designator, which is represented by an exclamation point (!). Table 19 describes history substitution option syntax.

Table 19 History Substitution Option Syntax

Syntax	Description
`!!`	Repeats the previous command.
`!<n>`	Repeats the command line numbered *n*.
`! –<n>`	Repeats the command whose number is the current command number minus *n*. The current command number is printed on the screen preceding the prompt. For example, if the current command is 100 and *n* is 2, command number 98 is repeated.

`!<string>`	Repeats the most recent command that starts with *string*. The SHow History command might display the following commands:
	`166 setdefault !1 -path control = enabled`
	`167 show -path configuration`
	`168 show history`
	`169 set screenlength = 23`
	`170 setdefault -bridge control = bridge`
	`171 show statistics ?`
	If you enter !setd at the prompt, the most recent occurrence of the SETDefault command (setd -br cont = b, number 170) is executed.

`!?<string>`	Repeats the most recent command containing *string*.

`^<string1>`
`^<string1>^<string2>`
	Repeats the most recent command that contains *string1*. If *string2* is specified, it substitutes for *string1* in that command. For example, if you entered this SETDefault command with a typing mistake:
	`seed welcomestring = "You are talking to the 3Com NETBuilder"`
	To repeat the command with the correct spelling of SETD, you do not need to reenter the entire command. Enter the following command:
	`^seed^setd`
	The following command is displayed and executed:
	`setd welcomestring = "You are talking to the 3Com NETBuilder"`

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Privilege Level

The privilege level determines which commands and parameters you can access. If you log on to the bridge/router with root login, your privilege level is Network Manager, which allows you access to all the commands and parameters.

You can create users with either User or Network Manager privilege. Some commands are available only to root. For more information, see "Adding User Accounts" on page 60.

ISDN-Related Syntax Variation (Models 43x and 44x)

Built-in ISDN ports use a different path numbering convention from other paths. Each B channel is assigned a different path. For instance, 3.1 and 3.2 are path numbers for a built-in ISDN port, where 3 is the connector ID, and 1 and 2 are the channel IDs. Some commands require you to specify the connector ID and channel ID of an ISDN path.

When using an ISDN TA connected to a serial port, both B channels are assigned the same path number. You do not need to use special ISDN syntax.

The syntax variation for these parameters is presented in the following format:

For non-ISDN interfaces

```
SETDefault !<path> -PATH CONtrol = (Enabled | Disabled)
SHow !<path> -PATH CONtrol
```

For built-in ISDN interfaces

```
SETDefault !<connectorID.channelID> -PATH CONtrol = (Enabled |
Disabled)
SHow [!<connectorID.channelID> | !<connectorID>.*] -PATH CONtrol
SHowDefault [!<connectorID.channelID> | !<connectorID>.*] -PATH
CONtrol
```

The software menus and help string do not give the syntax variation for ISDN interfaces. Although the software does not give this variation, you must input the syntax for these ISDN-related parameters as shown in this guide.

Some parameters in the ISDN-specific software are connector-related, which require that you specify a connector number (<connectorID>), for example, 3 only. Other parameters in the ISDN software are channel-related, which require that you specify both a connector and

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channel number (<connectorID>.<channelID>), for example, 3.1. When specifying both a connector and channel number, you must separate the two numbers with a decimal point.

If you do not specify a channel number in a command syntax that requires a connector and channel number, the bridge/router assumes the first channel associated with the specified connector. For example, if you specify only connector number 3 when the command syntax requires that you specify both a connector and channel number, the bridge/router assumes 3.1.

If you want to specify all channels associated with a connector in a command syntax, specify the connector number, a decimal point, then an asterisk, for example, 3.*

A path is the physical interface that connects the bridge/router to a physical medium such as an Ethernet bus, a token ring, or a serial line. In an ISDN environment, a path also represents the channel over which data is transmitted.

Getting Help

The user interface provides help menus as memory aids. To display the help menu, enter a question mark (?). The question mark can be used with different options as described in Table 20.

Table 20 Online Help Syntax Summary

Syntax	Description
?	Displays the help menu. Different commands are displayed depending on whether you have Network Manager privilege or User privilege. The commands are organized according to services. If you have User privilege and you enter a Network Manager command, the following message appears: `Insufficient privilege`
-?	Displays a list of services available on the bridge/router.

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Table 20 Online Help Syntax Summary (continued)

Syntax	Description
-<service> ?	Displays a list of commands within the selected service. For example, to display a list of commands in the SYS Service, enter the following command: **-SYS?** If there are no commands under the service you specify, a message is displayed to indicate this. For example: **-IDP?** No commands available in IDP service
<command> -<service> ?	Displays a list of parameters within the selected service. For example, to display a list of PORT Service parameters that can be used with the SETDefault command, enter the following command: **SETDefault -PORT?**
<command> ?	Displays the parameters by service name that can be used with the selected command. Only those parameters in services specified by the CurrentServices parameter are displayed.
<command> -<service> <parameter> ?	Displays the syntax for a command used with a particular parameter. For example, to display the syntax for the SETDefault command used with the CONTrol parameter in the SNMP Service, enter the following command: **SETDefault -SNMP CONTrol?**

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D

CONNECTORS AND CABLES

This chapter describes each connector and the cables that can be used with each connector on the bridge/router.

Console Connector and Cables

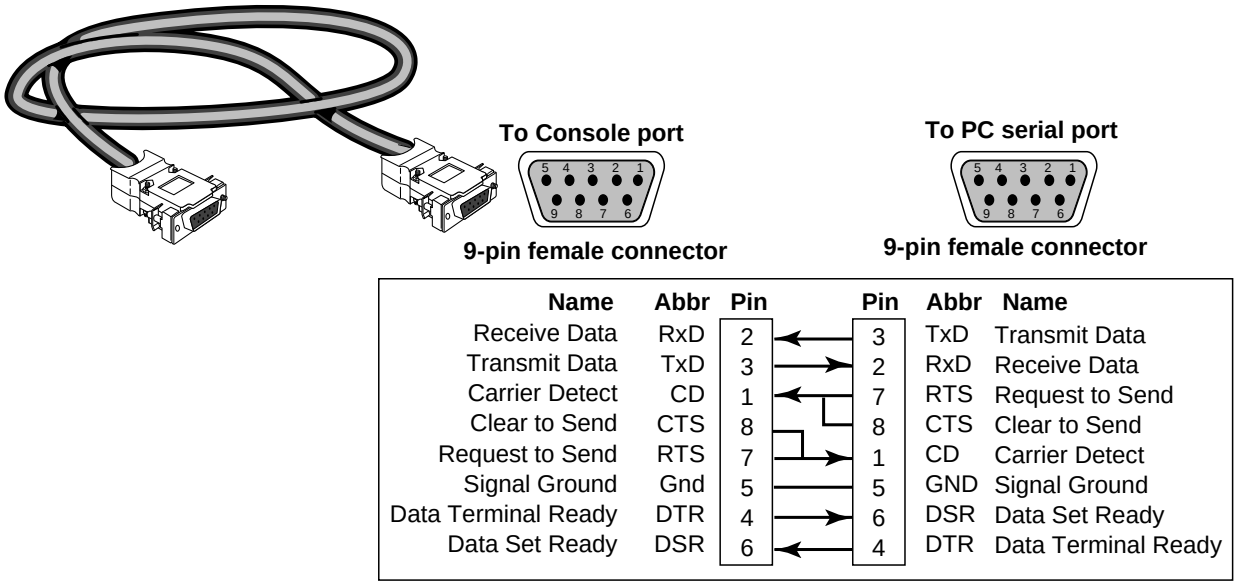
You can connect a PC running a terminal emulation program, a terminal, or a modem to the Console connector on the SuperStack II bridge/router.

WARNING: *To eliminate cable noise emission in excess of FCC Part 15, Subpart J, and EN55022 B, this device cable should be shielded and have connectors with metallic backshells.*

PC Cable

Figure 17 shows the pinouts for a 9-pin female to 9-pin null modem-type cable.

Figure 17 9-pin to 9-pin PC Cable (Null Modem-Type)



Name	Abbr	Pin		Pin	Abbr	Name
Receive Data	RxD	2	←	3	TxD	Transmit Data
Transmit Data	TxD	3	→	2	RxD	Receive Data
Carrier Detect	CD	1	←	7	RTS	Request to Send
Clear to Send	CTS	8		8	CTS	Clear to Send
Request to Send	RTS	7	→	1	CD	Carrier Detect
Signal Ground	Gnd	5		5	GND	Signal Ground
Data Terminal Ready	DTR	4	→	6	DSR	Data Set Ready
Data Set Ready	DSR	6	←	4	DTR	Data Terminal Ready

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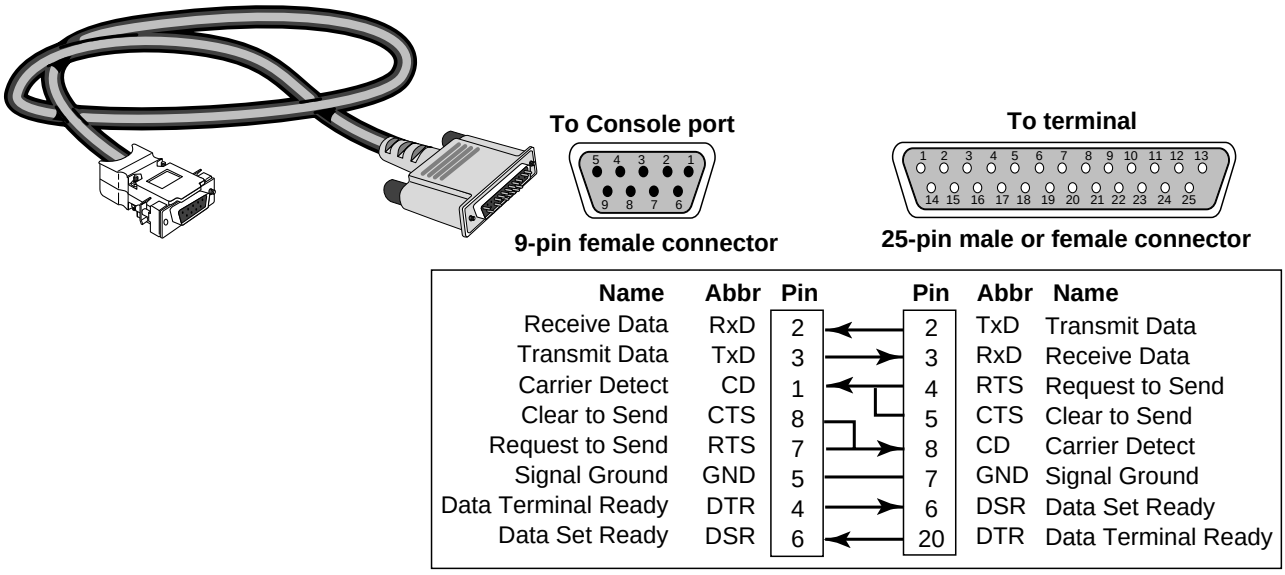
Terminal Cable

Figure 18 shows the pinouts for a 9-pin female to 25-pin null modem-type cable.

Figure 18 9-pin to 25-pin Terminal Cable (Null Modem-Type)

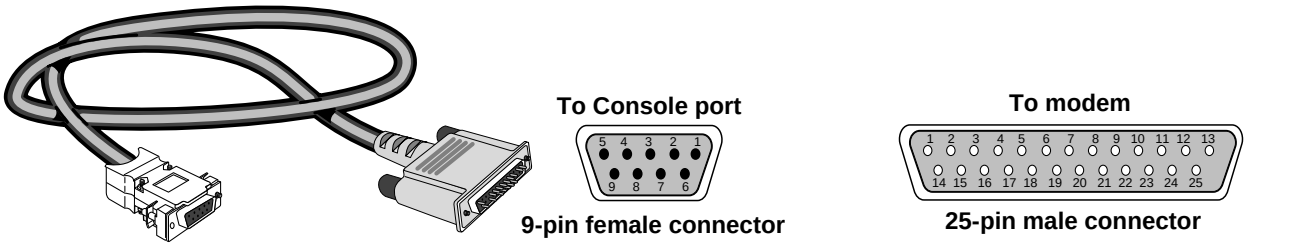

To Console port
5 4 3 2 1
9 8 7 6
9-pin female connector
To terminal
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25
25-pin male or female connector

Name	Abbr	Pin		Pin	Abbr	Name
Receive Data	RxD	2	←	2	TxD	Transmit Data
Transmit Data	TxD	3	→	3	RxD	Receive Data
Carrier Detect	CD	1	←	4	RTS	Request to Send
Clear to Send	CTS	8		5	CTS	Clear to Send
Request to Send	RTS	7	→	8	CD	Carrier Detect
Signal Ground	GND	5		7	GND	Signal Ground
Data Terminal Ready	DTR	4	→	6	DSR	Data Set Ready
Data Set Ready	DSR	6	←	20	DTR	Data Terminal Ready

Modem Cable

Figure 19 shows the pinouts for a 9-pin female to 25-pin male straight-through-type cable.

Figure 19 9-pin to 25-pin Modem Cable (Straight-Through-Type)


To Console port
5 4 3 2 1
9 8 7 6
9-pin female connector
To modem
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25
25-pin male connector

Name	Abbr	Pin		Pin	Abbr	Name
Transmit Data	TxD	3	→	2	TxD	Transmit Data
Receive Data	RxD	2	←	3	RxD	Receive Data
Request to Send	RTS	7	→	4	RTS	Request to Send
Carrier Detect	CD	1	←	8	CD	Carrier Detect
Clear to Send	CTS	8	←	5	CTS	Clear to Send
Signal Ground	GND	5		7	GND	Signal Ground
Data Set Ready	DSR	6	←	6	DSR	Data Set Ready
Data Terminal Ready	DTR	4	→	20	DTR	Data Terminal Ready

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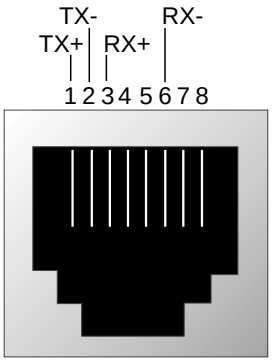
LAN Connector and Cables

The two Ethernet connectors, labeled L1 and L2, can be cabled using either 10BASE-T or 100BASE-TX cabling.

Boundary router models can use only the L1 Ethernet port. If you upgrade to full router software, the second port will be functional.

The following figure shows the pinouts of the L1 and L2 connectors (RJ-45). The connector bodies connect the cable shield to chassis ground.

Figure 20 Ethernet Connector



RJ-45 female (shielded)

10BASE-T Cabling

Table 21 lists supported 10BASE-T cable types and emissions classes.

Table 21 10BASE-T Cable Types and Emissions Compliance

		Emissions Compliance*	
Cable Type		**FCC and VCCI Class A**	**EN55022 Class B**
UTP†	100 ohm:		
	Category 3	yes	no
	Category 4	yes	no
	Category 5	yes	no
Shielded TP†	100 ohm:		
	Category 3	yes	yes
	Category 4	yes	yes
	Category 5	yes	yes

* Shielding of all cable types should be terminated 360 degrees at the cable plug.

† All UTP compliance testing was accomplished using cables built with Stewart Connector Co. connector, part number 940 SP-36-08-08.

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Cabling Standards

Cabling should be installed in accordance with the following standards:

- EIA/TIA-568 – Commercial building telecommunications wiring standard
- TSB-36 – Additional cable specifications for unshielded twisted pair cables
- IBM cabling guidelines

100BASE-TX Cabling

Table 22 lists supported 100BASE-TX cable types and emissions classes.

Table 22 Cable Support and Emissions Compliance

		Emissions Compliance*	
Cable Type	**Connectors**	**FCC Class A VCCI Class A**	**EN55022 Class B VDE Class B**
Category 5 UTP	Category 5 RJ-45 (including jacks)	Yes	No
Category 5 shielded UTP	Category 5 RJ-45 (including jacks)	Yes	Yes

* Shielding of all cable types should be terminated 360º at the cable plug.

The three types of Fast Ethernet interfaces are:

- **TX** — Runs over Category 5 UTP and Category 5 shielded UTP.
- **FX** — Runs over fiber. FX does **not** connect to the SuperStack II NETBuilder SI bridge/router, but you can use FX in your network between appropriate devices.
- **T4** — Runs over Category 3 or better UTP or shielded UTP. T4 does **not** connect to the SuperStack II NETBuilder SI bridge/router, but you can use T4 in your network between appropriate devices.

Follow the steps in the next section to design a valid Fast Ethernet network.

Creating a Valid Network

A Fast Ethernet network consists of *collision domain diameters* formed by cabling and/or repeaters between two DTE devices. A *DTE device* is a bridge/router, switch, or end station that contains a media access controller (MAC). Repeaters usually do not contain a MAC.

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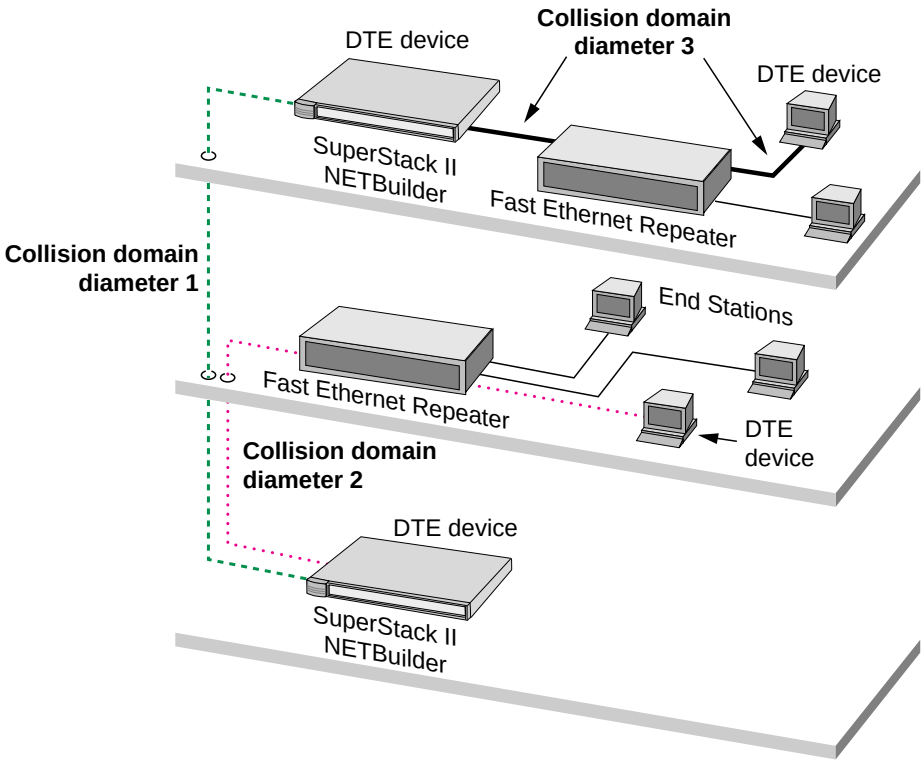
To create a valid collision domain diameter, you must adhere to the following maximum cable span lengths along with the collision domain diameter guidelines in Table 22:

- **UTP (running TX or T4)** — Maximum cable span length is ≤100 m.
- **Fiber (running FX)** — Maximum cable span length is ≤412 m.

Figure 21 shows examples of collision domain diameters.

Figure 21 Collision Domain Diameter Examples



To determine a valid collision domain diameter, follow these steps:

1. Determine which interfaces will be used: TX, FX, or T4.
2. Add up the combined length of all cabling to be used.
3. Determine which class of repeaters, if any, are used in the collision domain diameter.
4. Determine the maximum cable length by referring to Table 23, which contains cabling and repeater guidelines for three scenarios shown in Figure 22, Figure 23, and Figure 24.

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For expanded guidelines, refer to the IEEE Standard 802.3.

Figure 22 Collision Domain Diameter with No Repeater

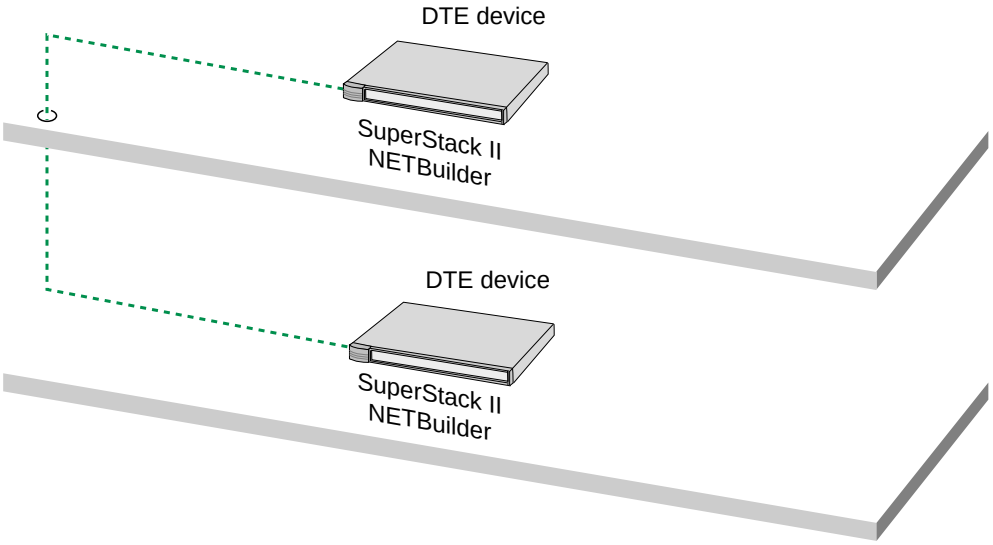

Figure 23 Collision Domain Diameter with One Repeater

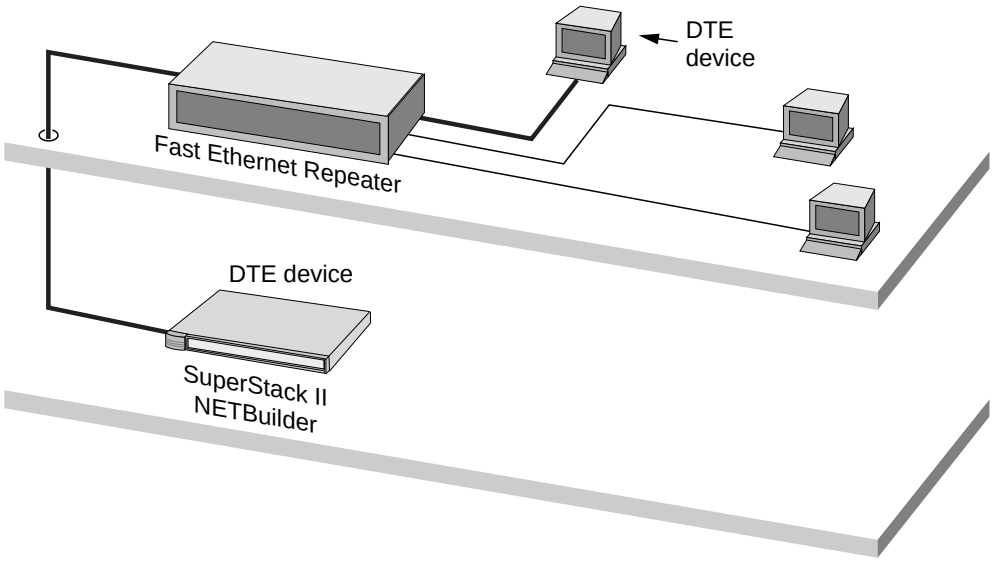

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Figure 24 Collision Domain Diameter with Two Repeaters

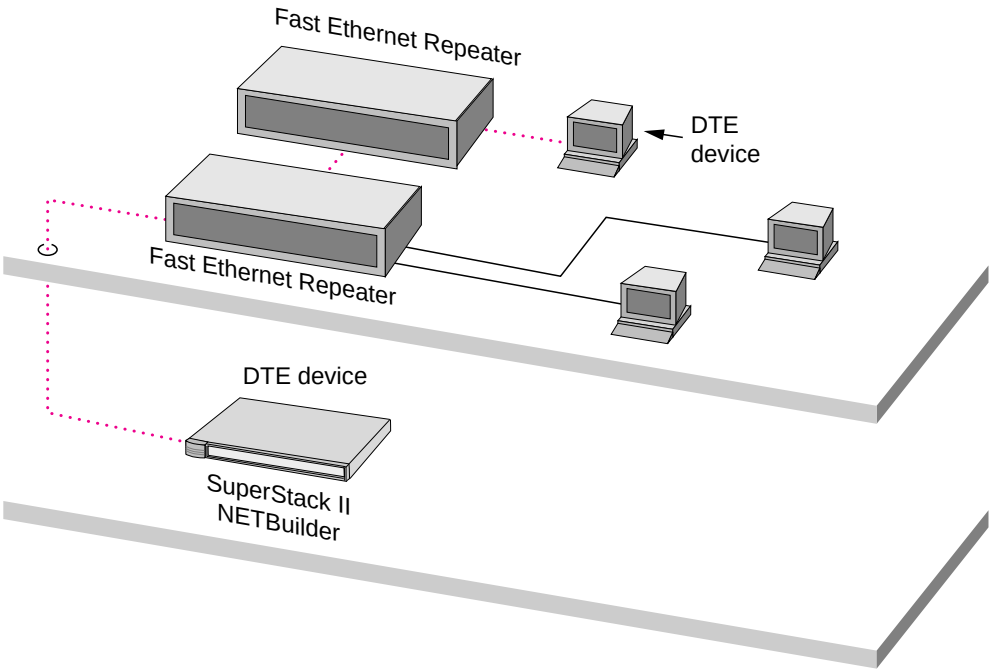

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Table 23 Maximum Cable Length in Example Collision Domain Diameters

	Maximum Combined Cable Length, by Interface			
Scenario	**TX and/or T4**	**FX Only**	**FX & TX**	**FX & T4**
No Repeaters (see Figure 22)	**100 m**	**412 m**	not applicable	not applicable
One Class 1 repeater* (see Figure 23)	**200 m** — 100 m *max.* on each side of the repeater	**272 m**	**260.8 m** 100 m *max.* TX Remaining length of FX	**231 m** 100 m *max.* T4 Remaining length of FX
One Class 2 repeater† (see Figure 23)	**200 m** — 100 m *max.* on each side of the repeater	**320 m**	**308.8 m** 100 m *max.* TX Remaining length of FX	**304 m**‡ 100 m *max.* T4 Remaining length of FX
Two Class 2 repeaters (see Figure 24)	**205 m** — 100 m *max.* per cable span	**228 m**	**216.2 m** 105 m *max.* total TX, 100 m *max.* per TX cable span Remaining length of FX	**263.3 m**‡ 105 m *max.* total T4, 100 m *max.* per T4 cable span Remaining length of FX

* A high-delay repeater as specified in IEEE 802.3 standards. A Class 1 repeater usually connects dissimilar media, for instance, UTP to fiber.

† A low-delay repeater as specified in IEEE 802.3 standards. A Class 2 repeater usually connects similar media, for instance, UTP to UTP.

‡ This scenario is unlikely, because Class 2 repeaters do not usually connect FX to T4.

WAN Connector and Cables

The WAN connector can be an ISDN S/T (model 43x and 53x), ISDN U (model 44x and 54x), 56/64 Kbps CSU/DSU (model 45x and 55x), or T1/FT1 CSU/DSU (model 46x and 56x) connector, depending on the interface module installed.

ISDN S/T Cable

To connect a model 43x or model 53x bridge/router to an ISDN network, use a Category 5 shielded twisted-pair cable with an RJ-45 connector on both ends. 3Com does not supply this cable.

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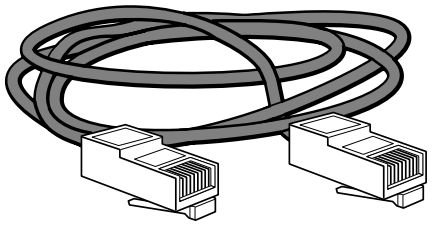
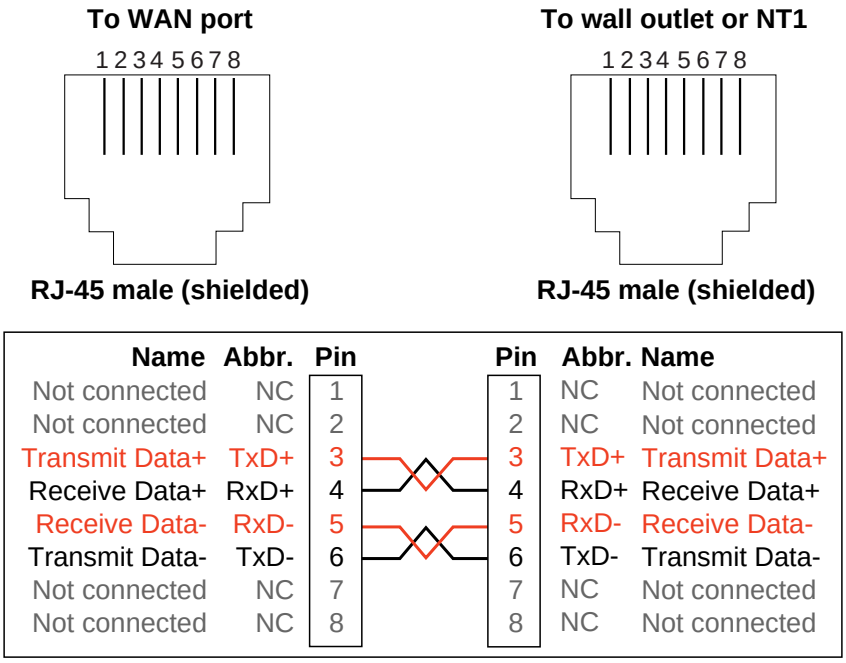
Figure 25 shows the pin assignments of the ISDN S/T cable.

Figure 25 ISDN S/T Cable





Name	Abbr.	Pin	Pin	Abbr.	Name
Not connected	NC	1	1	NC	Not connected
Not connected	NC	2	2	NC	Not connected
Transmit Data+	TxD+	3	3	TxD+	Transmit Data+
Receive Data+	RxD+	4	4	RxD+	Receive Data+
Receive Data-	RxD-	5	5	RxD-	Receive Data-
Transmit Data-	TxD-	6	6	TxD-	Transmit Data-
Not connected	NC	7	7	NC	Not connected
Not connected	NC	8	8	NC	Not connected

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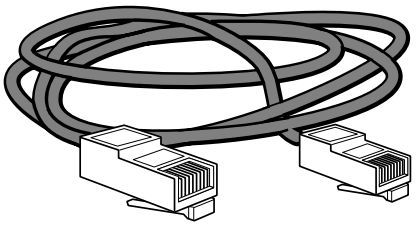
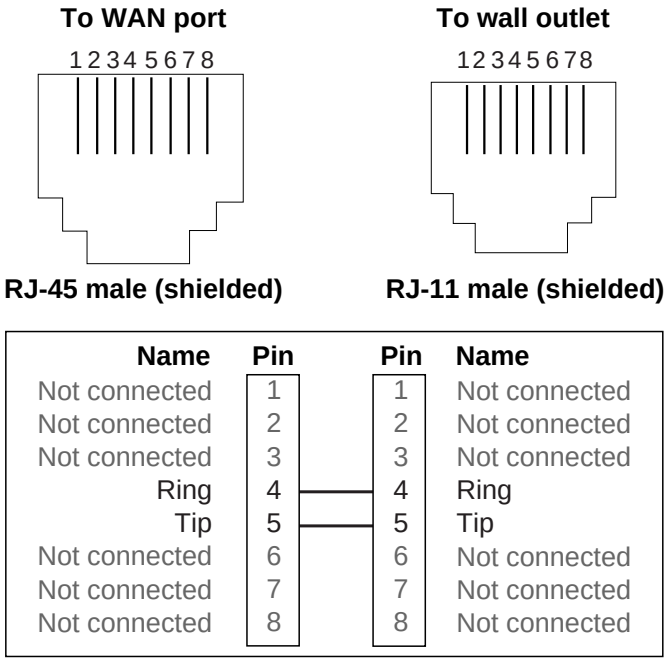
ISDN U Cable

To connect a model 44x or model 54x bridge/router to an ISDN network, use a Category 5 shielded twisted-pair cable with an RJ-45 connector on the bridge/router end, and an RJ-11 connector at the wall. This cable comes with your bridge/router.

Figure 26 shows the pinouts of the ISDN U cable.

Figure 26 ISDN U Cable





Name	Pin	Pin	Name
Not connected	1	1	Not connected
Not connected	2	2	Not connected
Not connected	3	3	Not connected
Ring	4	4	Ring
Tip	5	5	Tip
Not connected	6	6	Not connected
Not connected	7	7	Not connected
Not connected	8	8	Not connected

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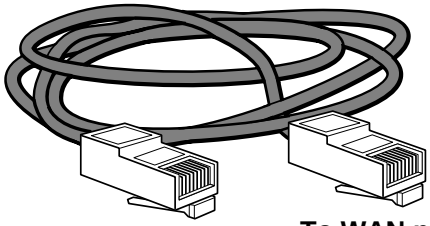
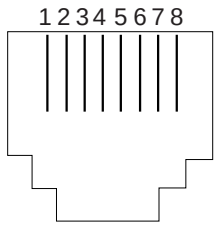
56/64K CSU/DSU Cable

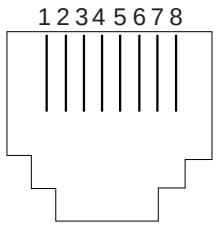
To connect a model 45x or model 55x bridge/router to a data digital service (DDS), use a cable with an RJ-48S connector. 3Com supplies this cable.

Figure 27 shows the pin assignments of the cable with both ends terminated in RJ-48S connectors.

Figure 27 CSU/DSU Cable







Name	Abbr.	Pin	Pin	Abbr.	Name
Transmit ring to network	R1	1	1	R1	Transmit ring to network
Transmit tip to network	T1	2	2	T1	Transmit tip to network
Not connected	NC	3	3	NC	Not connected
Not connected	NC	4	4	NC	Not connected
Not connected	NC	5	5	NC	Not connected
Not connected	NC	6	6	NC	Not connected
Receive tip from network	T	7	7	T	Receive tip from network
Receive ring from network	R	8	8	R	Receive ring from network

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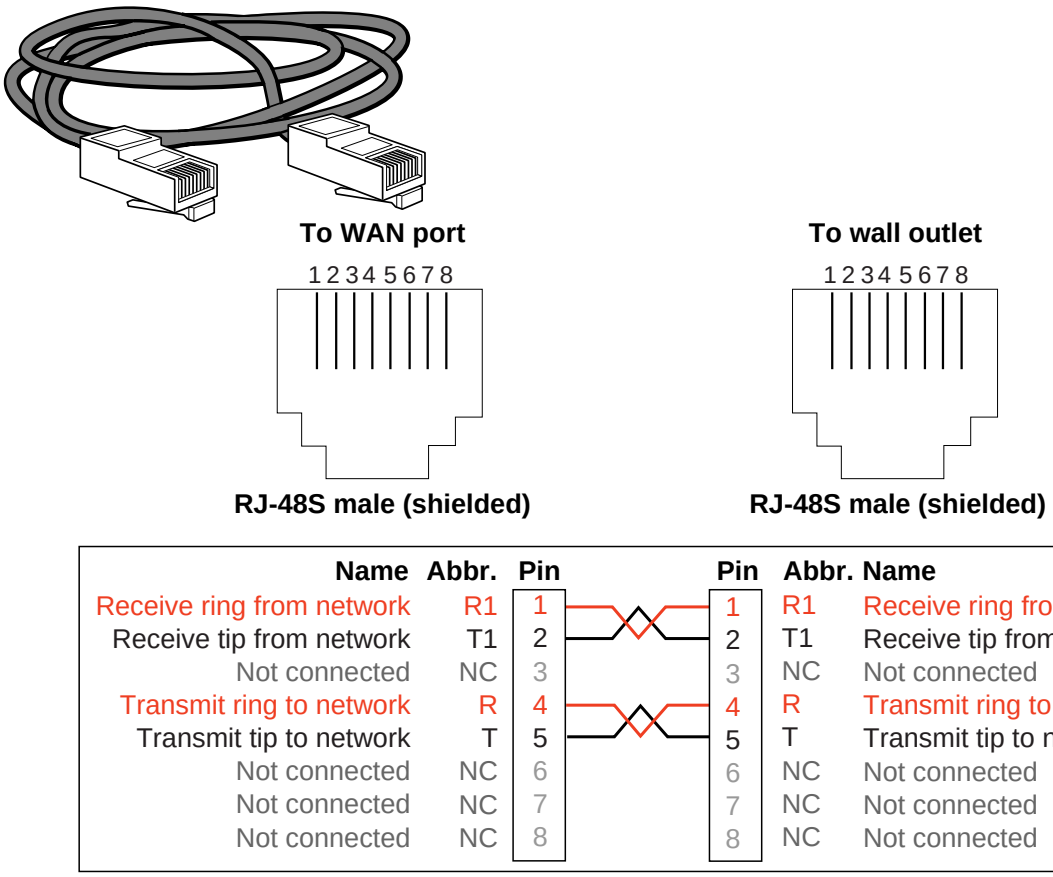
RJ-48 T1 Cable

To connect a model 46x or model 56x bridge/router to a T1 or fractional T1 line, use a cable with an RJ-48 connector. 3Com does not supply this cable.

Figure 27 shows the pin assignments of the cable with both ends terminated in RJ-48 connectors.

Figure 28 RJ-48 T1 Cable



Name	Abbr.	Pin		Pin	Abbr.	Name
Receive ring from network	R1	1		1	R1	Receive ring from network
Receive tip from network	T1	2		2	T1	Receive tip from network
Not connected	NC	3		3	NC	Not connected
Transmit ring to network	R	4		4	R	Transmit ring to network
Transmit tip to network	T	5		5	T	Transmit tip to network
Not connected	NC	6		6	NC	Not connected
Not connected	NC	7		7	NC	Not connected
Not connected	NC	8		8	NC	Not connected

Serial Connectors and Flex-WAN Cables

The serial connectors on the bridge/router can be connected to DTE and DCE devices with the following interfaces:

- RS-232
- V.35
- X.21
- RS-449
- RS-530 (DCE only)

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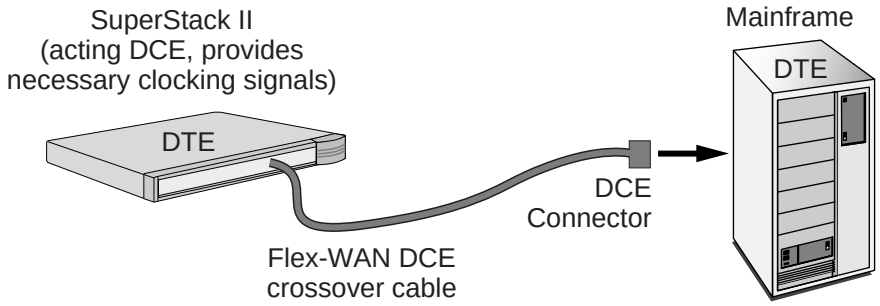
DTEs include mainframes and automatic teller machines. DCEs include modems and CSU/DSUs.

A DCE must always connect to a DTE, and vice versa. If you need to connect a DTE to a DTE, or a DCE to a DCE, you can use a crossover cable between the two devices.

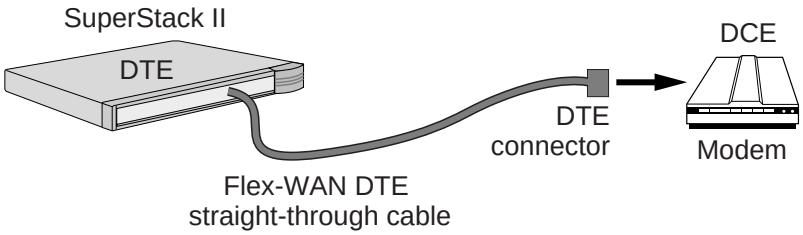
For example, a SuperStack II bridge/router is a DTE. To connect the bridge/router to another DTE, such as a mainframe, use a crossover Flex-WAN DCE cable. The DCE cable has a DCE connector on the end that connects to the mainframe (see Figure 29).

Figure 29 Connecting the Bridge/Router to a DTE Using a DCE Cable



To connect the bridge/router to a DCE, such as a modem, use a straight-through Flex-WAN DTE cable. The DTE cable has a DTE connector on the end that connects to the modem (see Figure 30).

Figure 30 Connecting the Bridge/Router to a DCE Using a DTE Cable



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Flex-WAN cables can be purchased from 3Com. Table 24 lists each Flex-WAN cable and part number. Cable pinouts are provided in the following sections.

Table 24 Flex-WAN Cables

Cable Length	Cable Type	Part Number	Pinouts
4 ft.	**RS-232 DTE** (straight-through cable to connect to a DCE)	3C89002	page 177
	RS-232 DCE (crossover cable to connect to a DTE)	3C89004	page 178
	V.35 DTE (straight-through cable to connect to a DCE)	3C89006	page 179
	V.35 DCE (crossover cable to connect to a DTE)	3C89008	page 180
	X.21 DTE (straight-through cable to connect to a DCE)	3C89010	page 181
	X.21 DCE (crossover cable to connect to a DTE)	3C890012	page 182
	RS-449 DTE (straight-through cable to connect to a DCE)	3C890014	page 183
	RS-449 DCE (crossover cable to connect to a DTE)	3C890016	page 184
	RS-530 DTE (straight-through cable to connect to a DCE)	3C890018	page 184
	V.35 extended shroud DTE (straight-through cable to connect to a DCE)*	3C890020	page 179
	V.35 extended shroud DCE (crossover cable to connect to a DTE)*	3C89022	page 180
10 ft.	**RS-232 DTE** (straight-through cable to connect to a DCE)	3C89001	page 177
	RS-232 DCE (crossover cable to connect to a DTE)	3C89003	page 178
	V.35 DTE (straight-through cable to connect to a DCE)	3C89005	page 179
	V.35 DCE (crossover cable to connect to a DTE)	3C89007	page 180
	X.21 DTE (straight-through cable to connect to a DCE)	3C89009	page 181
	X.21 DCE (crossover cable to connect to a DTE)	3C890011	page 182
	RS-449 DTE (straight-through cable to connect to a DCE)	3C890013	page 183
	RS-449 DCE (crossover cable to connect to a DTE)	3C890015	page 184
	RS-530 DTE (straight-through cable to connect to a DCE)	3C890017	page 184
	V.35 extended shroud DTE (straight-through cable to connect to a DCE)*	3C890019	page 179
	V.35 extended shroud DCE (crossover cable to connect to a DTE)*	3C890021	page 180

* The V.35 extended shroud cable is required for some equipment, particularly IBM legacy equipment.

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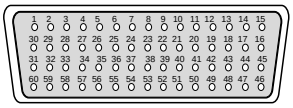
RS-232 DTE Cable Pinouts

This cable connects the bridge/router to an RS-232 DCE.

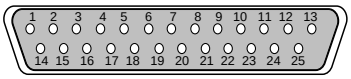
Figure 31 Flex-WAN and RS-232 DTE Connectors

To SuperStack II NETBuilder



60-pin Flex-WAN male connector

To DCE



25-pin male connector

Table 25 RS-232 DTE Cable Pinouts

Flex-WAN Connector			RS-232 DTE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
DCD/LL	33	←	8	DCD	1
DSR/DTR	34	←	6	DSR	2
CTS/RTS	35	←	5	CTS	3
RxD/TxD	36	←	3	RxD	4
TxC/Nil	37	←	15	TxC	5
RxC/TxCE	38	←	17	RxC	6
TxCE/TxC	39	→	24	TxCE	7
TxD/RxD	41	→	2	TxD	8
RTS/CTS	42	→	4	RTS	9
DTR/DSR	43	→	20	DTR	10
LL/DCD	44	→	18	LTST	11
Circuit Ground	45	-	7	Circuit Ground	12
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	50 51 52	-	-	-	-

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of each of the twisted pairs 1 to 12.

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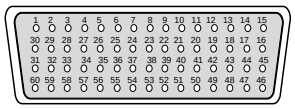
RS-232 DCE Cable Pinouts

This cable connects the bridge/router to an RS-232 DTE.

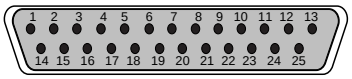
Figure 32 Flex-WAN and RS-232 DCE Connectors

To SuperStack II NETBuilder



60-pin Flex-WAN male connector

To DTE



25-pin female connector

Table 26 RS-232 DCE Cable Pinouts

Flex-WAN Connector			RS-232 DCE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
DCD/LL	33	←	18	LTST	1
DSR/DTR	34	←	20	DTR	2
CTS/RTS	35	←	4	RTS	3
RxD/TxD	36	←	2	TxD	4
RxC/TxCE	38	←	24	TxCE	5
TxCE/TxC	39	→	15	TxC	6
Nil/RxC	40	→	17	RxC	7
TxD/RxD	41	→	3	RxD	8
RTS/CTS	42	→	5	CTS	9
DTR/DSR	43	→	6	DSR	10
LL/DCD	44	→	8	DCD	11
Circuit Ground	45	-	7	Circuit Ground	12
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	50	-	-	-	-
	51				

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of each of the twisted pairs 1 to 12.

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V.35 DTE Cable Pinouts

This cable connects the bridge/router to a V.35 DCE.

Figure 33 Flex-WAN and V.35 DTE Connectors

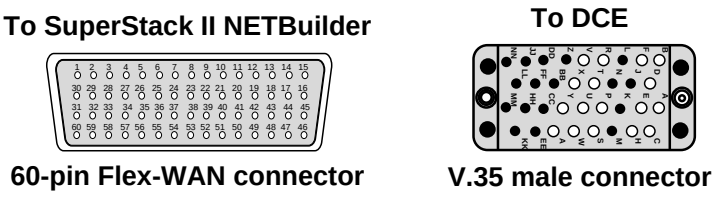

Table 27 V.35 DTE Cable Pinouts

Flex-WAN Connector			V.35 DTE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
SD/RD-	17	→	S	SD-	1
SD/RD+	18	→	P	SD+	
SCTE/SCT-	19	→	W	SCTE-	2
SCTE/SCT+	20	→	U	SCTE+	
TxC/RxC-	23	←	AA	SCT-	3
TxC/RxC+	24	←	Y	SCT+	
RxC/TxCE-	25	←	X	SCR-	4
RxC/TxCE+	26	←	V	SCR+	
RxD/TxD-	27	←	T	RD-	5
RxD/TxD+	28	←	R	RD+	
DCD/LL	33	←	F	RLSD	6
DSR/DTR	34	←	E	DSR	7
CTS/RTS	35	←	D	CTS	8
RTS/CTS	42	→	C	RTS	9
DTR/DSR	43	→	H	DTR	10
LL/DCD	44	→	K	LT	11
Circuit Ground	45	-	B	Ground	12
Shield Ground	46	Cable Shield	A	Shield Ground	-
Shorting Group 1	48 49	-	-	-	-
Shorting Group 2	50 51 52	-	-	-	-
Shorting Group 3	53 54 55 56	-	-	-	-

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of each of the twisted pairs 6 to 12.

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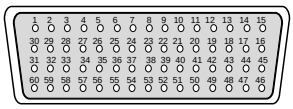
V.35 DCE Cable Pinouts

This cable connects the bridge/router to a V.35 DTE.

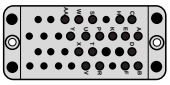
Figure 34 Flex-WAN and V.35 DCE Connectors

To SuperStack II NETBuilder



60-pin Flex-WAN connector

To DTE



V.35 female connector

Table 28 V.35 DCE Cable Pinouts

Flex-WAN Connector			V.35 DCE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
SD/RD-	17	→	T	RD-	1
SD/RD+	18	→	R	RS-	
SCTE/SCT-	19	→	AA	SCT-	2
SCTE/SCT+	20	→	Y	SCT+	
Nil/SCR-	21	→	X	SCR-	3
Nil/SCR+	22	→	V	SCR+	
RxC/TxCE-	25	←	W	SCTE-	4
RxC/TxCE+	26	←	U	SCTE+	
RxD/TxD-	27	←	S	SD-	5
RxD/TxD+	28	←	P	SD+	
DCD/LL	33	←	K	LT	6
DSR/DTR	34	←	H	DTR	7
CTS/RTS	35	←	D	RTS	8
RTS/CTS	42	→	C	CTS	9
DTR/DSR	43	→	E	DSR	10
LL/DCD	44	→	F	RLSD	11
Circuit Ground	45	-	B	Ground	12
Shield Ground	46	Cable Shield	A	Shield Ground	-
Shorting Group 1	48 49	-	-	-	-
Shorting Group 2	50 51	-	-	-	-
Shorting Group 3	53 54 55 56	-	-	-	-

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of each of the twisted pairs 6 to 12.

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X.21 DTE Cable Pinouts

This cable connects the bridge/router to an X.21 DCE.

Figure 35 Flex-WAN and X.21 DTE Connectors

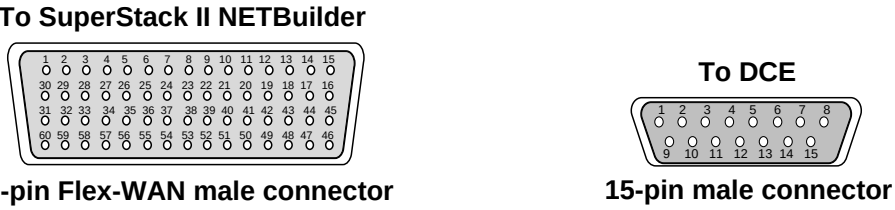

Table 29 X.21 DTE Cable Pinouts

Flex-WAN Connector			X.21 DTE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
CTS/RTS+	1	←	5	Indicate+	1
CTS/RTS-	2	←	12	Indicate-	
RTS/CTS+	9	→	3	Control+	2
RTS/CTS-	10	→	10	Control-	
TxD/RxD+	11	→	2	Transmit+	3
TxD/RxD-	12	→	9	Transmit-	
Circuit Ground	15	-	8	Control GND	4
RxC/TxCE-	25	←	13	Timing-	5
RxC/TxCE+	26	←	6	Timing+	
RxD/TxD-	27	←	11	Receive-	6
RxD/TxD+	28	←	4	Receive+	
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	47 48	-	-	-	-
Shorting Group 2	51 52	-	-	-	-

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of twisted pair 4.

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X.21 DCE Cable Pinouts

This cable connects the bridge/router to an X.21 DTE.

Figure 36 Flex-WAN and X.21 DCE Connectors

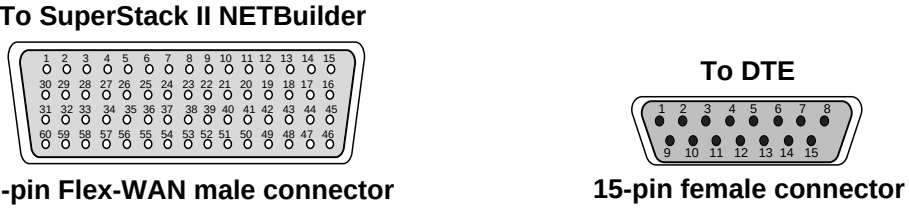

Table 30 X.21 DCE Cable Pinouts

Flex-WAN Connector			X.21 DCE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair***
CTS/RTS+	1	←	1	Control+	1
CTS/RTS-	2	←	2	Control-	
RTS/CTS+	9	→	5	Indicate+	2
RTS/CTS-	10	→	12	Indicate-	
TxD/RxD+	11	→	4	Receive+	3
TxD/RxD-	12	→	11	Receive-	
Circuit Ground	15	-	8	Control GND	4
TxC/RxC-	23	←	13	Timing-	5
TxC/RxC+	24	←	6	Timing+	
RxD/TxD-	27	←	9	Transmit-	6
RxD/TxD+	28	←	2	Transmit+	
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	47 48	-	-	-	-

* Unused twisted wires of a twisted pair should be connected to Shield Ground. In this cable this is one wire of twisted pair 4.

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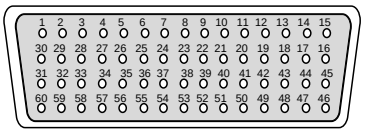
RS-449 DTE Cable Pinouts

This cable connects the bridge/router to an RS-449 DCE.

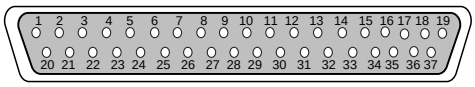
Figure 37 Flex-WAN and RS-449 DTE Connectors

To SuperStack II NETBuilder



60-pin Flex-WAN male connector

To DCE



37-pin male connector

Table 31 RS-449 DTE Cable Pinouts

Flex-WAN Connector			RS-449 DTE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair**
CTS/RTS+	1	←	9	CS+	1
CTS/RTS-	2	←	27	CS-	
DSR/DTR+	3	←	11	DM+	2
DSR/DTR-	4	←	29	DM-	
DCD/DCD+	5	←	13	RR+	3
DCD/DCD-	5	←	31	RR-	
DTR/DSR+	7	→	12	TR+	4
DTR/DSR-	8	→	30	TR-	
RTS/CTS+	9	→	7	RS+	5
RTS/CTS-	10	→	25	RS-	
TxD/RxD+	11	→	25	SD+	6
TxD/RxD-	12	→	4	SD-	
TxCE/TxC+	13	→	17	TT+	7
TxCE/TxC-	14	→	35	TT-	
Circuit Ground	15	-	19	SGRC	8
Circuit Ground	16	-	20	SGRC	
TxC/RxC-	23	←	23	ST-	9
TxC/RxC+	24	←	5	ST+	
RxC/TxCE-	25	←	26	RT-	10
RxC/TxCE+	26	←	8	RT+	
RxD/TxD-	27	←	24	RD-	11
RxD/TxD+	28	←	6	RD+	

(continued)

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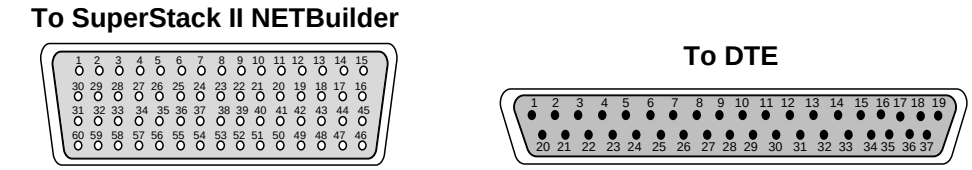
Table 31 RS-449 DTE Cable Pinouts (continued)

Flex-WAN Connector			RS-449 DTE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair**
LL/DCD	44	→	10	LLSC	12
Circuit Ground	45	–	37	Circuit Ground	
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	48 49	-	-	-	-
Shorting Group 2	51 52				-

RS-449 DCE Cable Pinouts

This cable connects the bridge/router to an RS-449 DTE.

Figure 38 Flex-WAN and RS-449 DCE Connectors



60-pin Flex-WAN male connector **37-pin female connector**

Table 32 RS-449 DCE Cable Pinouts

Flex-WAN Connector			RS-449 DCE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair**
CTS/RTS+	1	←	7	RS+	1
CTS/RTS-	2	←	25	RS-	
DSR/DTR+	3	←	12	TR+	2
DSR/DTR-	4	←	30	TR-	
DCD/DCD+	5	←	13	RR+	3
DCD/DCD-	5	←	31	RR-	
DTR/DSR+	7	→	11	DM+	4
DTR/DSR-	8	→	29	DM-	
RTS/CTS+	9	→	9	CS+	5
RTS/CTS-	10	→	27	CS-	
TxD/RxD+	11	→	6	RD+	6
TxD/RxD-	12	→	24	RD-	

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Table 32 RS-449 DCE Cable Pinouts (continued)

Flex-WAN Connector			RS-449 DCE Connector		
Signal	**Pin**	**Direction**	**Pin**	**Signal**	**Twisted Pair**
TxCE/TxC+	13	→	5	ST+	7
TxCE/TxC-	14	→	23	ST-	
Circuit Ground	15	-	19	SGRC	8
Circuit Ground	16	-	20	SGRC	
TxC/RxC-	23	←	26	RT-	9
TxC/RxC+	24	←	8	RT+	
RxC/TxCE-	25	←	35	TT-	10
RxC/TxCE+	26	←	17	TT+	
RxD/TxD-	27	←	22	SD-	11
RxD/TxD+	28	←	4	SD+	
Nil/LL	29	←	10	LLSC	12
Circuit Ground	30	-	37	Ground	
Shield Ground	46	Cable Shield	1	Shield Ground	-
Shorting Group 1	48 49	-	-	-	-

RS-530 DTE Cable Pinouts

This cable connects the bridge/router to an RS-530 DCE.

Figure 39 Flex-WAN and RS-530 DTE Connectors

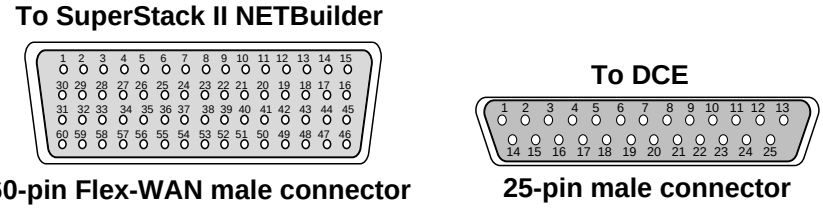

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Table 33 RS-530 DTE Cable Pinouts

Flex-WAN Connector			RS-530 DTE Connector	
Signal	**Pin**	**Direction**	**Pin**	**Signal**
CTS/RTS+	1	←	5	CTS+
CTS/RTS-	2	←	13	CTS-
DSR/DTR+	3	←	6	DSR+
DSR/DTR-	4	←	22	DSR-
DCD/DCD+	5	←	8	DCD+
DCD/DCD-	5	←	10	DCD-
DTR/DSR+	7	→	20	DTR+
DTR/DSR-	8	→	23	DTR-
RTS/CTS+	9	→	4	RTS+
RTS/CTS-	10	→	19	RTS-
TxD/RxD+	11	→	2	TxD+
TxD/RxD-	12	→	14	TxD-
TxCE/TxC+	13	→	24	TxCE+
TxCE/TxC-	14	→	11	TxCE-
TxC/RxC-	23	←	12	TxC-
TxC/RxC+	24	←	15	TxC+
RxC/TxCE-	25	←	9	RxC-
RxC/TxCE+	26	←	17	RxC+
RxD/TxD-	27	←	16	RxD-
RxD/TxD+	28	←	3	RxD+
LL/DCD	44	←	18	LL
Circuit Ground	45	-	7	Circuit Ground
Shield Ground	46	Cable Shield	1	Shield Ground
Shorting Group 1	47 48 49	-	-	-

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E

PROVISIONING YOUR ISDN LINE

This appendix provides U.S., Canadian, German, and Dutch provisioning information for the built-in ISDN port on model 43x, 53x, 44x and 54x SuperStack II NETBuilder SI bridge/routers.

Ordering U.S. and Canadian ISDN BRI Services

To order ISDN service from your telephone company, follow these steps:

1. Call the telephone company and ask for the ISDN representative.
2. Tell the representative you want ISDN service for a SuperStack II NETBuilder SI bridge/router, and that you have the following information:
   - Line provisioning
   - ISDN outlet type
3. Tell the representative that the Bellcore ISDN ordering code (IOC) is "Capability R." The IOC tells the telephone company which parameter settings to use for SuperStack II bridge/routers.

Not all Regional Bell Operating Companies use IOCs.

4. If you have a model 43x or model 53x bridge/router with an ISDN S/T connector, ask for an NT1 to connect your SuperStack II bridge/router to the ISDN line. (You can also purchase an NT1 from a reseller.)
5. Ask for the following information to fill out the ISDN Information Sheet:
   - **ISDN Switch Type.** Ask the representative which ISDN switch type your line uses. Place a check mark next to that switch on the ISDN Information Sheet. Each switch type has a corresponding provisioning information table later in this section.
   - **Number of ISDN Phone Numbers.** Your ISDN line can support one or two phone numbers. Specify how many phone numbers you are ordering.

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- **Phone Numbers.** Ask the telephone representative for your ISDN phone numbers and write them in the space provided.
- **Service Profile ID (SPID) Number.** Ask the telephone representative for your SPID numbers. ((For a point-to-point line only one SPID may be provided. For a multipoint line, the telephone representative should provide two SPID numbers.) A SPID number has 10–15 characters; for example, 0155512120. Your switch type may not require the SPID number.

Your telephone company gives you the phone number and SPID number after it installs your line.

ISDN Information Sheet **3Com SuperStack II NETBuilder SI Bridge/Router**
ISDN Switch Type
AT&T 5ESS NI1 ❒
AT&T 5ESS Custom ❒
Northern Telecom DMS 100 ❒
Siemens EWSD ❒
Number of ISDN phone numbers (1 or 2)
Phone number 1
Phone number 2
SPID number for phone number 1
SPID number for phone number 2

If your telephone company has the IOC for a SuperStack II bridge/router or boundary router, you do not need to complete step 6.

6 Provide provisioning information that corresponds to your ISDN switch using the tables in the following sections.

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Switch Provisioning Tables

This section provides provisioning information for the following switch types in the U.S. and Canada:

- AT&T 5ESS
- AT&T 5ESS Custom
- DMS 100 and National ISDN 1
- Siemens EWSD

AT&T 5ESS Switch

To order ISDN service for an AT&T 5ESS switch, provide the telephone company with the information in Table 34.

Table 34 Ordering ISDN Service for an AT&T 5ESS Switch

Required Information	Specification
Line type	National ISDN 1 line
Line code	2B1Q (2B+D)
Interface type	S/T interface with NT1 (model 43x) or U interface (model 44x) and RJ-45 jack
Maximum terminals (MAXTERM)	1
Maximum B channels (MAXB CHNL)	2
Actual user	Yes
Circuit-switched data	2
Circuit-switched data channel	Any
Terminal type	A-Basic or E-Type (data only) Terminal
Display	No
Circuit-switched data limit	2
Voice or data	Data
Call appearance	Idle
DN (directory number) must be set as follows:	
Parameter	**Setting**
B1	Circuit-switched data
B2	Circuit-switched data
D	Signaling only
MAXTERM	1
MAXB CHNL	2
ACT USR	Y
CSD	2

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Table 34 Ordering ISDN Service for an AT&T 5ESS Switch (continued)

Required Information	Specification
CSD CHL	Any
TERMTYP	TYPEA or TYPEE
Display	No
CSD Limit	2
CA PREF	1

AT&T 5ESS Custom Switch

To order ISDN service for an AT&T 5ESS custom switch, provide the telephone company with the information in Table 35.

Table 35 Ordering ISDN Service for an AT&T 5ESS Custom Switch

Required Information	Specification
Line type	ISDN line with point-to-point configuration
Line code	2B1Q (2B+D)
Interface type	S/T interface with NT1 (model 43x) or U interface (model 44x) and RJ-45 jack
Maximum terminals (MAXTERM)	1
Maximum B channels (MAXB CHNL)	2
Circuit-switched data (CSD)	2
Circuit-switched data channel (CSD CHL)	Any
Terminal type (TERMTYP)	A-Basic or E-Type (data only) Terminal
Display	No
Voice or data	Data
Call appearance preference	Idle
DN must be set as follows:	
Parameter	**Setting**
B1	Circuit-switched data
B2	Circuit-switched data
D	Signaling only
ACT USR	Yes
TERMTYP	TYPEA or TYPEE
CSD Limit	2
CA PREF	1

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A point-to-point configuration on a SuperStack II bridge/router or boundary router is selected by setting the SPIDn1 and SPIDn2 parameters to none.

DMS 100 and National ISDN 1

To order ISDN service for a DMS 100 or National ISDN 1 switch, provide the telephone company with the information in Table 36.

Table 36 Ordering ISDN Service for a DMS 100 Switch

Required Information	Specification
Line type	DMS 100 or National ISDN 1 line
Line code	2B1Q (2B+D)
Interface type	S/T interface with NT1 (model 43x) or U interface (model 44x) and RJ-45 jack
Circuit-switched option	Yes
Bearer Restriction option	No packet mode data (NOPMD)
Protocol	Functional version 0 (PVC 0) for DMS 100
	Functional version 2 (PVC 2) for National ISDN
SPID suffix	1 in North America only
Terminal endpoint identifier (TEI)	Dynamic
Ring	No
Key system (EKTS)	No
Voice or data	Data
DN must be set as follows:	
Parameter	**Setting**
B1	Circuit-switched data
B2	Circuit-switched data
D	Signaling only
MAXTERM	1
MAXB CHNL	2
ACT USR	Y
CSD	2
CSD CHL	Any
Display	No
CSD Limit	2
CA PREF	1

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Siemens EWSD Switch

To order ISDN service for a Siemens EWSD switch, provide the phone company with the information in Table 36.

Table 37 Ordering ISDN Service for a Siemens EWSD Switch

Required Information	Specification
Line Type	National ISDN 1 line
Line Code	2B1Q (2B+D)
Interface Type	S/T interface with NT1 (model 43x) or U interface (model 44x) and RJ-45 jack
Circuit-switched Option	Yes
Bearer Restriction Option	No packet mode data (NOPMD)
Protocol	PPP
SPID suffix	1
Terminal Endpoint Identifier (TEI)	Dynamic
Ring	No
Maximum Keys	64
Key System (EKTS)	No
Voice or Data	Data
Lower Layer Compatibility Option for Data	B channels

SPIDs

When you request services, you may also need the following information about SPIDs and other service attributes:

- Request multipoint, initializing terminal service; the maximum number of terminals is two. The service provider supplies you with two SPIDs.
- If you request ISDN service from an AT&T 5ESS service provider and the switch is running custom (or non-National ISDN 1) software, the format is:

  01 + 7-digit telephone number + 1-digit suffix.
- If you request a different telephone numbers for each B channel, the suffix can be the same. A suffix of 0 is typical in this case. If you decide to use the same telephone number for both B channels, use a different suffix so that the two SPIDs are unique.
- If you request NI-1 (National ISDN 1) service from an AT&T 5ESS service provider, the format is:

  01 + 7-digit telephone number + 1-digit suffix + 2-digit TID (terminal identifier).

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- The SPID numbers must be unique. The 2-digit TID can be any number from 0 to 62. The TID has no effect on the operation of the SuperStack II bridge/router, but it is a necessary part of the SPID that the bridge/router uses to gain access to the ISDN network.
- If you request ISDN service from a Northern Telecom DMS-100 service provider, the format is:

  Area code + 7-digit telephone number + 0 to 8 digit suffix + 2 digit TID.
- The TID can be any number from 0 to 62, but needs to be unique so that the SPIDs are also unique. This format applies when the switch is running Custom and NI-1 (North American 3) versions of software.
- If you order AT&T 5ESS Custom ISDN services, choose either a Type A or Type E terminal. The Type E terminal is preferable because it is for data only.
- **Do not** request supplementary services, such as autohold or conference, because a SuperStack II bridge/router does not support them.

NT1s and Power Supplies

The models 43x and 53x bridge/routers do not come with an NT1. North American telephone companies require an NT1 and a power supply for every ISDN line. Your service provider or telephone company can provide you with an NT1 and power supply for a small monthly fee. However, you may prefer to purchase it from an ISDN equipment vendor. The NT1 and power supply may come in a single, standalone box or the two may be in separate units. In this discussion, the two units together are referred to as an NT1.

The model 44x and model 54x bridge/routers have an integrated NT1.

Telephone companies in North America use two kinds of NT1s, differentiated by the data encoding scheme used in transmitting data between the NT1 and the telephone company's equipment. The two data encoding schemes are 2B1Q (two bits mapped into one quaternary symbol) and alternate mark inversion (AMI). The 2B1Q scheme is the dominant method in use today. The AMI scheme is older and rarely used.

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Ordering German ISDN BRI Services

To order German ISDN services, follow these steps:

1. Acquire a form entitled "Telefondienstauftrag im ISDN (Euro-ISDN-Anschluß)" from the Telekom.
2. At the top of the form, select "Neuanschluß."
3. Under "Auftraggeber," provide the requested information.
4. Under "Anschluß," specify "Basisanschluß als Standardanschluß."

   By specifying "Basisanschluß als Standardanschluß, " you are requesting standard basic rate interface (BRI) service. Under "Anschrift Standort," provide the requested information.
5. Under "Anschlußnutzung," specify "Mehrgeräteanschluß."

   By specifying "Mehrgeräteanschluß," you are requesting a connection for multiple types of equipment, such as bridge/routers, telephones, faxes, and computers.
6. Sign your name at the bottom of the form.

The SuperStack II bridge/router software does not currently support the 1TR6 switch type. If you have an existing 1TR6 connection, request that the connection be changed to a Euro-ISDN connection using this form. In case the Telekom requests this information, the approval number for Germany (Bundesamt Für Zulassungen In Der Telekommunikation) is A115352E.

When ordering ISDN lines in Germany, make sure to order point-to-multipoint ISDN lines. The SuperStack II bridge/router does not support point-to-point configurations when attached to the German ISDN network.

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Ordering Dutch ISDN BRI Services

To order ISDN services from the Dutch PTT, follow these steps:

1. Acquire a form entitled "Aanvraag formulier ISDN aansluiting from the Dutch PTT."
2. Under 1, specify "Nieuwe ISDN-aansluiting".
3. Under 3, specify the requested connection date.
4. Under 4, specify "Enkelvoudige ISDN-2 aansluiting".
5. Under 7, specify how many phone numbers you want to assign to the ISDN line (MSN).
6. Under 8, specify any extra services required.
7. Provide the requested information for parts 13 through 22.
8. Sign your name at the bottom of the form.

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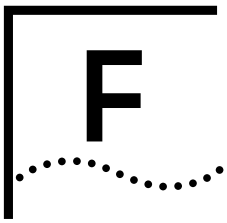

TECHNICAL SUPPORT

3Com provides easy access to technical support information through a variety of services. This appendix describes these services.

Information contained in this appendix is correct at time of publication. For the very latest, 3Com recommends that you access the 3Com Corporation World Wide Web site.

Online Technical Services

3Com offers worldwide product support 24 hours a day, 7 days a week, through the following online systems:

- World Wide Web site
- 3Com FTP site
- 3Com Bulletin Board Service (3Com BBS)
- 3ComFacts℠ automated fax service

World Wide Web Site

Access the latest networking information on the 3Com Corporation World Wide Web site by entering the URL into your Internet browser:

```
http://www.3com.com/
```

This service provides access to online support information such as technical documentation and software library, as well as support options ranging from technical education to maintenance and professional services.

3Com FTP Site

Download drivers, patches, software, and MIBs across the Internet from the 3Com public FTP site. This service is available 24 hours a day, 7 days a week.

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To connect to the 3Com FTP site, enter the following information into your FTP client:

- Hostname: **ftp.3com.com** (or **192.156.136.12**)
- Username: **anonymous**
- Password: **<your Internet e-mail address>**

A user name and password are not needed with Web browser software such as Netscape Navigator and Internet Explorer.

3Com Bulletin Board Service

The 3Com BBS contains patches, software, and drivers for 3Com products. This service is available through analog modem or digital modem (ISDN) 24 hours a day, 7 days a week.

Access by Analog Modem

To reach the service by modem, set your modem to 8 data bits, no parity, and 1 stop bit. Call the telephone number nearest you:

Country	Data Rate	Telephone Number
Australia	Up to 14,400 bps	61 2 9955 2073
Brazil	Up to 14,400 bps	55 11 5181 9666
France	Up to 14,400 bps	33 1 6986 6954
Germany	Up to 28,800 bps	4989 62732 188
Hong Kong	Up to 14,400 bps	852 2537 5601
Italy	Up to 14,400 bps	39 2 27300680
Japan	Up to 14,400 bps	81 3 3345 7266
Mexico	Up to 28,800 bps	52 5 520 7835
P.R. of China	Up to 14,400 bps	86 10 684 92351
Taiwan, R.O.C.	Up to 14,400 bps	886 2 377 5840
U.K.	Up to 28,800 bps	44 1442 438278
U.S.A.	Up to 53,333 bps	1 847 262 6000

Access by Digital Modem

ISDN users can dial in to the 3Com BBS using a digital modem for fast access up to 64 Kbps. To access the 3Com BBS using ISDN, use the following number:

1 847 262 6000

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3ComFacts Automated Fax Service

The 3ComFacts automated fax service provides technical articles, diagrams, and troubleshooting instructions on 3Com products 24 hours a day, 7 days a week.

Call 3ComFacts using your Touch-Tone telephone:

1 408 727 7021

Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to obtain assistance from the 3Com online technical resources or from your network supplier, 3Com offers technical telephone support services. To find out more about your support options, please call the 3Com technical telephone support phone number at the location nearest you.

When you contact 3Com for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

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Below is a list of worldwide technical telephone support numbers:

Country	Telephone Number	Country	Telephone Number
Asia Pacific Rim			
Australia	1 800 678 515	P.R. of China	10800 61 00137 or
Hong Kong	800 933 486		021 6350 1590
India	61 2 9937 5085	Singapore	800 6161 463
Indonesia	001 800 61 009	S. Korea	
Japan	0031 61 6439	From anywhere in S. Korea:	82 2 3455 6455
Malaysia	1800 801 777	From Seoul:	00798 611 2230
New Zealand	0800 446 398	Taiwan, R.O.C.	0080 611 261
Pakistan	61 2 9937 5085	Thailand	001 800 611 2000
Philippines	1235 61 266 2602		
Europe			
From anywhere in Europe, call:	+31 (0)30 6029900 phone +31 (0)30 6029999 fax		
From the following European countries, you may use the toll-free numbers:			
Austria	06 607468	Netherlands	0800 0227788
Belgium	0800 71429	Norway	800 11376
Denmark	800 17309	Poland	0800 3111206
Finland	0800 113153	Portugal	05 05313416
France	0800 917959	South Africa	0800 995014
Germany	0130 821502	Spain	900 983125
Hungary	00800 12813	Sweden	020 795482
Ireland	1 800 553117	Switzerland	0800 55 3072
Israel	177 3103794	U.K.	0800 966197
Italy	1678 79489		
Latin America			
Argentina	AT&T +800 666 5065	Mexico	01 800 CARE (01 800 2273)
Brazil	0800 13 3266	Peru	AT&T +800 666 5065
Chile	1230 020 0645	Puerto Rico	800 666 5065
Colombia	98012 2127	Venezuela	AT&T +800 666 5065
North America	1 800 NET 3Com (1 800 638 3266)		

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Returning Products for Repair

Before you send a product directly to 3Com for repair, you must first obtain a Return Materials Authorization (RMA) number. Products sent to 3Com without RMA numbers will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
Asia, Pacific Rim	65 543 6500	65 543 6348
Europe, South Africa, and Middle East	+ 44 1442 435860	+ 44 1442 435718
From the following European countries, you may call the toll-free numbers; select option 2 and then option 2:		
Austria	06 607468	
Belgium	0800 71429	
Denmark	800 17309	
Finland	0800 113153	
France	0800 917959	
Germany	0130 821502	
Hungary	00800 12813	
Ireland	1800553117	
Israel	177 3103794	
Italy	1678 79489	
Netherlands	0800 0227788	
Norway	800 11376	
Poland	00800 3111206	
Portugal	05 05313416	
South Africa	0800 995014	
Spain	900 983125	
Sweden	020 795482	
Switzerland	0800 55 3072	
U.K.	0800 966197	
Latin America	1 408 326 2927	1 408 326 3355
U.S.A. and Canada	1 800 NET 3Com (1 800 638 3266)	1 408 326 7120

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INDEX

SYMBOLS

? command 123

Numerics

100BASE-TX
  cable 166
  connector 165
100mb LED 125
10BASE-T
  cable 165
  connector 165
3Com bulletin board service (3Com BBS) 198
3Com URL 197
3ComFacts 199

A

abbreviated syntax 154
Active LED
  LAN 125
  serial 124
addresses
  BOOTP server 108
  IP, assigning 103
  IPX, assigning 109
AddUser command 60
aliases, creating 157
AT&T 5ESS switch
  custom, ordering 190
  standard, ordering 189
AuditLog service 62
Aux LED 124

B

B channels 24
bandwidth 91
bandwidth management 89
bandwidth-on-demand 91
baud
  Ethernet 70
  serial 76
Baud parameter 76
baud rate, console port
  configuring 60
  default 60
Boot command 121
boot path 121
BOOTP server 108, 151
boundary router
  active ports 34
  cabling Ethernet 34
Boundary Routing, central node 101
BRI 24
bridging 101
  per-port 102
BT command 121
bulletin board service 198

C

cables
  100BASE-TX 166
  10BASE-T 165
  console 163
  CSU/DSU 173
  Ethernet 165, 166
  ISDN 170, 172
  modem 164
  PC 163
  serial 174
  T1 174
  terminal 164
cabling
  Ethernet connectors 34
  ISDN connectors
    S/T 35
    U 35
  LAN connectors 34
  serial connectors 37
  WAN connectors 35
cabling standards, Ethernet 166
canadian certification notice 4
CD-ROM
  documentation 29
  software 29

Downloaded from www.Manualslib.com manuals search engine

CE notice 5
central node, configuring for Boundary Routing 101
channels
  B 24
  D 24
command-line interface
  accessing 56, 57
  components of 57
  service names 157
  short cuts
    abbreviated syntax 153
    aliases 157
    history substitution 158
  syntax
    abbreviated description 154
    examples 155
    full form description 153
    symbols used 154
commands
  ? 123
  AddUser 60
  Boot 121
  BT 121
  DELeteUser 60
  DF 122
  Display Files 122
  entering 57
  H 123
  Help 123
  help on 160
  history substitution 158
  MEnu 56, 57
  overview 56
  PassWord 60
  privilege level 159
  RB 123
  Reboot 123
  repeating 158
  service names 157
  syntax 56, 156
    abbreviated 154
    full form 153
    symbols used 154
  SysconF 60, 121
  SysPassWord 59
  UserManage 61
COMmunity parameter 62
configuring
  bandwidth-on-demand 91
  baud rate
    Ethernet 70
    serial port 76
  bridging 101
  CSU/DSU port 74
  dial-on-demand 90
  dial pool 82, 87
  dial-up 79
  disaster recovery 92
  Frame Relay 93
  IP routing 102
  IPX routing 109
  ISDN 80
  ISDN TAs 75
  manual dial 90
  Multilink PPP 82
  PPP 79
  virtual ports
    dial pool 85, 89
    Frame Relay 94, 95
    X.25 98
  WAN ISDN 80
  X.25 97
Connect LED 125
connecting a console 39
connector types for serial ports 76
connectors
  L1, L2 165
  WAN 170
console
  attaching 55
  baud rate 60
console, connecting 39
conventions
  notice icons, About This Guide 15
  syntax 153
  text, About This Guide 16
cost, OSPF 107
CSU/DSU
  cable 173
  description 24
  loopback plug 29
  module, FCC Part 68 4
CSU/DSU port
  configuring 74
  statistics 115
CurrentServices parameter, environment 157

D

D channel 24
Data Link Connection Identifier. *See* DLCI
date and time 61
default ISDN switch type 71
default route, IPX 110
DELeteUser command 60
DF command 122

Downloaded from www.Manualslib.com manuals search engine

dial number lists 113
dial-on-demand 90
dial pool
  configuring ISDN 82
  configuring serial 87
  dynamic paths 64
dial-up
  configuring 79
  dial number list
    editing 114
    using 113 to 114
  IPX routing 109
  using OSPF 107
DialCONTrol parameter 64
dial-up lines description 25
disaster recovery 92
Display Files command 122
DMS 100 switch, ordering 191
documentation CD-ROM 29
Dump Destination firmware parameter 146
duplex Ethernet 70
dynamic paths 64
dynamic routing protocols 106

E

electromagnetic compatibility information 2
equipment required 29
Ethernet
  100BASE-TX 70
  10BASE-T 70
  baud 70
  cables 165, 166
  cabling standards 166
  cabling the connector 34
  configuring ports 70
  duplex 70
  fast 70
  port 23
ETSI switch, Line Act LED 54
ExDevType parameter 76

F

fast Ethernet 70
Fault LED 124
  LAN 125
  serial 124
  WAN 125
fax service (3ComFacts) 199
FCC Part 68 4
  CSU/DSU module 4
  NT1 module 4
feet, attaching 31
Flex-WAN. *See* serial port
For 25
Frame Relay
  configuring 93
  DLCIs 93
  fully meshed topology 97
  nonmeshed topology 94
  overview 27
  partially meshed topology 95
  virtual ports 94, 95
front panel LEDs 124
full form syntax 153
fully meshed topology
  Frame Relay 97
  X.25 99
Fwd LED 124

G

German ISDN BRI services 194

H

H command 123
hardware interrupt switch 20
Help command 123
help menu 160
history substitution command 158

I

installing
  in a rack 33
  on a tabletop 31
  stacking with brackets 32
interoperability 83
IP addresses, assigning 103
IP routing
  configuring 102
  metrics 104
  route redundancy 107
  static routes
    adding 103
    Override option 106
  subnet masks 105
IPX routing
  configuring 109
  default route 110
  over dial-up lines 109
  packets, unknown destination 110
  route redundancy 110
  static routes

Downloaded from www.Manualslib.com manuals search engine

adding 109
Override option 110
IPXWAN 109
ISDN
acquiring telecommunication services 194, 195
BRI 24
cable 170, 172
cabling the connector
S/T 35
U 35
description 24
German BRI services 194
information sheet 188
loopback testing 133
North American BRI services 187
port 24
provisioning tables 189
SPIDs 192
switch types 71
default 71
ETSI 54
supported 72
TA, configuring 75, 86

L

LAN
cabling the connector 34
LAN LEDs 125
leased lines, description 25
LEDs
error meanings 126
LAN 125
Line Act with ETSI switch 54
normal operation 54, 124
serial 124
system 124, 126
WAN 125
level, privilege 159
Line Act LED
normal 125
with ETSI switch 54
Line Error LED 125
lines
dial-up 25
leased 25
Link LED
LAN 125
serial 124
WAN 125
LMI protocol 93
load errors 152
Load LED 124, 126
LocalDialNo parameter 70
LocaSubAddr parameter 71
logging on 55
loopback plug 29
loopback testing
ISDN 133
serial 135, 137, 141, 144

M

MAC addresses, memory dump 147
manual dial 90
MEnu command 56, 57
menu-driven interface
accessing 57
exiting from 57
functions 56
limitations 56
meshed topology
Frame Relay 97
X.25 99
metric 104
MIBs 197
modems, configuring dial-up 86
monitor utility 20, 127, 151
mounting
in a rack 33
on a tabletop 31
stacking units 32
Multilink PPP 82
multiple paths per port 65
multiple ports per path 65

N

network manager privilege 59
network supplier support 199
nonmeshed topology
Frame Relay 94
X.25 98
NT1 35, 36, 193
NT1 module, FCC Part 68 4
numbering
paths 69
ports 69

O

online technical services 197
OSPF
configuring 106
cost 107
over dial-up lines 107

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P

packet-switched services 25
parameters
  Baud 76
  COMmunity 62
  DialCONTrol 64
  ISDN switch types 72
  LocalDialNo 70
  LocalSubAddr 71
  overview 56
  PAths 65, 92
  RemoteManager 62
  selecting 57
  SPIDdn1, SPIDdn2 72
  SpidWIZard 70
  SysCONtact 61
  SysLOCation 61
  SysNAMe 61
parent ports 68
partially meshed topology, Frame Relay 95
PassWord command 60
passwords
  changing 59
  default 59
PATH service
  Baud parameter 76
  DialCONTrol parameter 64
  ExDevType parameter 76
  LocalDialNo parameter 70
  LocalSubAddr parameter 71
  SPIDdn1, SPIDdn2 parameter 72
  SpidWIZard parameter 70
paths
  definition 63
  dynamic 64
  multiple paths per port 65, 92
  multiple ports per path 65
  naming restrictions 111
  numbering 69
  static 64
PAths parameter 65, 92
PORT service PAths parameter 65, 92
ports
  CSU/DSU statistics 115
  definition 64
  Ethernet, configuring 70
  ISDN 24
  multiple paths per port 65, 92
  multiple ports per path 65
  naming restrictions 111
  numbering 69
  parent 68
  serial
    configuring DCEs 75
    configuring DTEs 76
  virtual
    configuring dial pool 85, 89
    configuring Frame Relay 94, 95
    configuring X.25 98
    inherited attributes 68
    naming restrictions 111
    over Frame Relay and X.25 66
    over PPP 67
  WAN 170
  WAN CSU/DSU, configuring 74
  WAN ISDN, configuring 70, 80
power supply redundancy 38
power, turning off 39
Power/Fault LED 124
PPP, configuring 79
privilege level 159
  network manager 59
  user 59

R

rack-mount
  installation 33
  kit 31
RB command 123
Reboot command 123
recovering the software 151
Redundant Power System (RPS), attaching 38
reloading system software 151
RemoteManager parameter 62
repeating commands 158
required equipment 29
returning products for repair 201
route redundancy
  configuring for IP 107
  configuring for IPX 110
routes, static
  IP 103
  IPX 109
Run LED 124

S

SCID 65
security 62
serial cables 174
serial port
  configuring with DCEs 75
  configuring with DTEs 76
serial ports

Downloaded from www.Manualslib.com manuals search engine

recommended serial devices 21
services
packet-switched 25
telco 25
shipping carton contents 29
shutting down 39
Siemens EWSD switch, ordering 192
simple network management protocol. *See* SNMP
SNMP
accessing the bridge/router 55
read-only access 62
SNMP service
COMmunity parameter 62
software
CD-ROM 29
recovery 29
software, configuring
console port baud rate 60
passwords 59
security 62
system information 61
time and date 61
SPIDdn1, SPIDdn2 parameters 72
SPIDs 192
SpidWIZard, supported switch types 70
stacking units with mounting brackets 32
starting up
logging on 55
turning on power 53
static paths 64
static routes
IP over PPP 104
IPX 109
Override option, IP 106
Override option, IPX 110
statistics, CSU/DSU port 115
Status LEDs 124
subnet masks 105
switch type
default 71
SpidWIZard, supported 70
supported 72
switches
AT&T 5ESS 189
AT&T 5ESS (custom) 190
DMS 100 191
National 191
Siemens EWSD 192
syntax, command
abbreviated 154, 155
full form 153, 155
symbols used 154
SYS Service
ALias parameter 157
RemoteManager parameter 62
SYS service
PRIvilege parameter 59
SysCONtact parameter 61
SysLOCation parameter 61
SysNAMe parameter 61
V54Lback parameter 136
SysCallerID 65
SysconF command 121
SysCONtact parameter 61
SysLOCation parameter 61
SysNAMe parameter 61
SysPassWord command 59
system information 61
system information summary 147

T

T1
cable 174
tabletop installation 31
TAs, configuring dial-up 86
technical support
3Com URL 197
bulletin board service 198
fax service 199
network suppliers 199
product repair 201
Telco services 25
Telnet 55
terminal
attaching 55
baud rate 60
configuration settings 39
connecting 39
Test LED 131
TFTP server 151
time and date 61
transparent bridging 101
troubleshooting
deleted image files 126
during test phase 131
load errors 126
Load LED 126
load phase 126
Test LED 131

U

URL 197
user accounts 60
user interface

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command-line 56
ISDN variation 159
menu-driven 56
User privilege 59
UserManage command 61

V

V.35 DCE connector
described 25
V.35 DTE connector 25
virtual ports
configuring dial pool 85, 89
configuring Frame Relay 94, 95
configuring X.25 98
definition 65
inherited attributes 68
naming restrictions 111
over
Frame Relay and X.25 66
PPP 67

W

WAN LEDs 125
WAN port
configuring CSU/DSU 74
configuring ISDN 70
World Wide Web (WWW) 197

X

X.25
configuring 97
fully meshed topology 99
nonmeshed topology 98
overview 26
virtual ports 98

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